Food and Agriculture
Organization of the
United Nations

Global Forest Resources Assessment 2020

Main report

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Global Forest Resources Assessment 2020

Main report

Food and Agriculture Organization of the United Nations
Rome 2020

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Contents

iii Contents
viii Foreword
ix Acknowledgements
x Acronyms and abbreviations
xi Key findings

1 1. Introduction
3 Process
5 Scope
6 Data analysis
6 Outputs

11 2. Forest extent and changes
13 Forest area
21 Other land with tree cover
23 Other wooded land

25 3. Forest characteristics
27 Naturally regenerating forest
30 Planted forest
32 Plantation forest and other planted forest
34 Plantations of introduced species
34 Primary forest
38 Mangroves
39 Bamboo
40 Rubber plantations

41 4. Growing stock biomass and carbon
44 Growing stock
45 Growing-stock composition
48 Biomass stock
51 Carbon stock

55 5. Designation and management
58 Global overview
58 Analysis by designation category

77 6. Ownership and management rights
79 Forest ownership
82 Private ownership, by type of owner
83 Holders of management rights in publicly owned forests

87 7. Disturbances
92 Insects
93 Diseases
94 Severe weather events

97 8. Policies and legislation
99 Findings

101 9. Employment and education
103 Employment
104 Education

107 10. Non-wood forest products removals and value

115 11. Discussion
117 Enhanced country participation
117 Reduced reporting burden
117 Stronger capacity development
119 Improved data availability and quality

123 12. Conclusion
125 Take-home messages
126 Next steps

127 Annexes
129 Annex 1. Statistical factsheets
136 Annex 2. Global tables
163 References

TABLES

4 Table 1. Key milestones in the development of the Global Forest Resources Assessment 2020
14 Table 2. Forest area, by region and subregion, 2020
15 Table 3. Top ten countries for forest area, 2020
15 Table 4. Top ten countries and territories for forest cover as a percentage of total land area, 2020
16 Table 5. Forest area, by region and subregion, 1990–2020
17 Table 6. Annual average net change in forest area, by region and subregion, 1990–2020
18 Table 7. Top ten countries for average annual net loss of forest area, 2010–2020
18 Table 8. Top ten countries for average annual net gain in forest area, 2010–2020
19 Table 9. Deforestation rate, by climatic domain, for four periods spanning 1990–2020
19 Table 10. Deforestation rate, by region and subregion, for four periods spanning 1990–2020
23 Table 11. Area of other land with tree cover, by region and subregion, 2020
23 Table 12. Area of other wooded land, by region and subregion, 2020
24 Table 13. Top ten countries for area of other wooded land, 2020
24 Table 14. Area of other wooded land and annual change, by region and subregion, 1990–2020
28 Table 15. Area of naturally regenerating forest, by region and subregion, 2020
28 Table 16. Area of naturally regenerating forest, by region and subregion, 1990–2020
29 Table 17. Annual change in the area of naturally regenerating forest, by region and subregion, 1990–2020
30 Table 18. Area of planted forest, and planted forest as a proportion of total forest area, by region and subregion, 2020
30 Table 19. Top ten countries and territories for planted forest as a proportion of total forest area, 2020
31 Table 20. Area of planted forest, by region and subregion, 1990–2020
31 Table 21. Annual change in the area of planted forest, by region and subregion, 1990–2020
32 Table 22. Area of plantation forest and other planted forest, by region and subregion, 2020
33 Table 23. Top ten countries and territories for plantation forest as a proportion of total forest area, 2020
35 Table 24. Plantation forests composed of introduced species, by region and subregion, 2020
35 Table 25. Plantation forests composed of introduced species as a proportion of total plantation forest area, by region and subregion, 1990–2020
36 Table 26. Area of primary forest, by region and subregion, 2020
36 Table 27. Top five countries for primary forest area, 2020
37 Table 28. Top five countries and territories for primary forest as a proportion of total forest area, 2020
37 Table 29. Area of primary forest and annual change, by region and subregion, 1990–2020
38 Table 30. Area of mangroves, by region and subregion, 2020
39 Table 31. Area of mangroves and annual change, by region and subregion, 1990–2020
39 Table 32. Area of bamboo, by region and subregion, 2020
40 Table 33. Area of rubber plantations, by reporting country, 2020
44 Table 34. Volume of forest growing stock, by region and subregion, 2020
45 Table 35. Top ten countries for volume of forest growing stock, 2020
46 Table 36. Total volume of forest growing stock, by region and subregion, 1990–2020
46 Table 37. Volume of forest growing stock per hectare, by region and subregion, 1990–2020
48 Table 38. Volume of biomass and dead-wood stock, by region and subregion, 2020
49 Table 39. Forest biomass conversion and expansion factor, root–shoot ratio and dead–live ratio, by region and subregion, 2020
49 Table 40. Total living biomass, by region and subregion, 1990–2020
50 Table 41. Dead-wood stock, by region and subregion, 1990–2020
51 Table 42. Forest carbon stock in carbon pools, by region and subregion, 2020
52 Table 43. Total forest carbon stock, by region and subregion, 1990–2020

59 Table 44. Forest area designated primarily for production, by region and subregion, 2020
59 Table 45. Top ten countries for share of forest area designated primarily for production, 2020
60 Table 46. Forest area designated primarily for production, and annual change, by region and subregion, 1990–2020
61 Table 47. Forest area designated primarily for multiple use, by region and subregion, 2020
61 Table 48. Countries and territories with 100 percent of their total forest area designated primarily for multiple use, 2020
62 Table 49. Area of forest designated primarily for multiple use, and annual change, by region and subregion, 1990–2020
63 Table 50. Forest area designated primarily for soil and water protection, by region and subregion, 2020
64 Table 51. Top ten countries and territories for the proportion of total forest area designated primarily for soil and water protection, 2020
64 Table 52. Area of forest area designated primarily for soil and water protection, and annual change, by region and subregion, 1990–2020
66 Table 53. Forest area designated primarily for biodiversity conservation, by region and subregion, 2020
66 Table 54. Top ten countries and territories for the proportion of total forest area designated primarily for biodiversity conservation, 2020
67 Table 55. Area of forest designated primarily for biodiversity conservation, and annual change, by region and subregion, 1990–2020
68 Table 56. Forest area designated primarily for social services, by region and subregion, 2020
68 Table 57. Top ten countries for the proportion of total forest area designated primarily for social services, 2020
69 Table 58. Area of forest designated primarily for social services, and annual change, by region and subregion, 1990–2020
70 Table 59. Forest area designated primarily for other management objectives, by region and subregion, 2020
71 Table 60. Forest in protected areas, by region and subregion, 2020
72 Table 61. Top ten countries for forest in protected areas, 2020
72 Table 62. Forest in protected areas, and annual change, by region and subregion, 1990–2020
73 Table 63. Area of forest with long-term management plans, by region and subregion, 2020
74 Table 64. Forest area with long-term management plans, and annual change, by region and subregion, 2000–2020
80 Table 65. Forest ownership, by region and subregion, 2015
80 Table 66. Top ten countries and territories for the proportion of privately owned forest, 2015
81 Table 67. Forest ownership, by region and subregion, 1990–2015
82 Table 68. Area of forest in three types of private ownership, by region, 2015
83 Table 69. Holders of management rights to public forests, by region, 2015
92 Table 70. Proportion of tree-covered burned area in total wildfire area, by region or subregion, 2001–2018
92 Table 71. Country-reported burned area, by ecological domain, 2015
93 Table 72. Forest area affected by insects, by region, 2015
93 Table 73. Forest area disturbed by insects annually, by region, 2002–2016
94 Table 74. Forest area affected by disease, by region, 2015
94 Table 75. Forest area affected annually by disease, by region, 2002–2017
95 Table 76. Forest area affected by severe weather events, by region, 2015
95 Table 77. Forest area affected by severe weather events, by region, 2002–2015
96 Table 78. Number and forest area of countries reporting on forest degradation, by region
103 Table 79. Number of people employed in forestry and logging, by region, 2015
104 Table 80. Number of people employed in forestry and logging, by region, 1990–2015
105 Table 81. Number of graduated students, by level of education, 2015
105 Table 82. Graduated students in forestry, by region and level of education, 2015

110 Table 83. Reporting coverage for non-wood forest products
112 Table 84. Industrial wood and woodfuel removals, by region and subregion, 1990–2018
120 Table 85. The three-class tier system applied in the assessment of data quality
120 Table 86. Number of countries by data-reliability tier, for six indicators
121 Table 87. Proportion of forest area (%) by data-reliability tier, for six indicators
121 Table 88. Proportion of forest area in data-reliability tier 3, by region

FIGURES

6 Figure 1. Regional and subregional breakdown used in the Global Forest Resources Assessment 2020
7 Figure 2. Sustainable Development Goal 15, and relevant targets
8 Figure 3. Forest area as a proportion (%) of total land area, 2000, 2010 and 2015–2020, by Sustainable Development Goal regional grouping
9 Figure 4. Traffic-light dashboard for subindicators of indicator 15.2.1, 2020
14 Figure 5. The global distribution of forests, by climatic domain
16 Figure 6. Forest area as a percentage of total land area, 2020
17 Figure 7. Forest area, by region, 1990–2020
21 Figure 8. Global distribution of consensus among eight satellite-based datasets
22 Figure 9. Global area of other land with tree cover, 1990–2020
27 Figure 10. Components of planted forest
33 Figure 11. Proportion of plantation forest and other planted forest, by region, 2020
34 Figure 12. Plantation forest and other planted forest as a proportion of total planted forest area, by region, 1990–2020
40 Figure 13. Total area of bamboo, 1990–2020
40 Figure 14. Total area of rubber plantations, 1990–2020
44 Figure 15. Forest growing stock per unit area, by country, 2020
45 Figure 16. Naturally regenerating and planted forest growing stock distribution, by region, 2020
47 Figure 17. Proportion of growing stock in planted forest, by region, 1990–2020
47 Figure 18. Volume of growing stock for the top five genera, Africa, 2020
47 Figure 19. Volume of growing stock for the top five genera, Asia, 2020
47 Figure 20. Volume of growing stock for the top five genera, Europe, 2020
47 Figure 21. Volume of growing stock for the top five genera, North America, 2020
50 Figure 22. Regional and global trends in biomass stock per hectare, by region, 1990–2020
52 Figure 23. Trends in total forest carbon stock, by carbon pool, 1990–2020
53 Figure 24. Change in forest biomass carbon stock, by region and subregion, 1990–2020
53 Figure 25. Forest carbon stock per hectare, by carbon pool, 1990–2020
58 Figure 26. Proportion of total forest area designated for various primary management objectives, by region and globally, 2020
60 Figure 27. Proportion of total forest area designated primarily for production, by region, 1990–2020
62 Figure 28. Proportion of total forest area designated primarily for multiple use, by region, 1990–2020
65 Figure 29. Proportion of total forest area designated primarily for the protection of soil and water,by region, 1990–2020
67 Figure 30. Proportion of total forest area designated primarily for biodiversity conservation, by region, 1990–2020
70 Figure 31. Proportion of total forest area designated primarily for social services, by region, 1990–2020
71 Figure 32. Proportion of total forest area designated primarily for other purposes, by region, 1990–2020
75 Figure 33. Forest area certified under the Forest Stewardship Council and the Programme for the Endorsement of Forest Certification, 1990–2019
75 Figure 34. Total area of certified forest after adjustment for double certification, by region, 2000–2019
79 Figure 35. Proportion of total forest area, by three ownership categories, 2015

81 Figure 36. Proportion of total forest area, by ownership type and region, 1990–2015
83 Figure 37. Proportion of total private forest area, by ownership type and region, 1990–2015
84 Figure 38. Proportion of total publicly owned forest area, by holder of administrative rights and region, 2015
84 Figure 39. Proportion of total area of publicly owned forests, by holder of management rights and region, 1990–2015
90 Figure 40. Global total land area burned per year, 2001–2018
90 Figure 41. Total land area burned in 2001–2018, by region or subregion
91 Figure 42. Annual average land area burned between 2001 and 2018, by region or subregion
96 Figure 43. Proportion of total forest area of countries reporting on forest degradation, by climatic domain
96 Figure 44. Criteria used in national definitions of degraded forest
96 Figure 45. Methods applied by countries for monitoring degraded forest
106 Figure 46. Number of forestry students, by degree category, 2000–2015
106 Figure 47. Proportion of female and male graduated forestry students, by education level, 2000–2015
110 Figure 48. Global importance of non-wood forest product categories, 2015
111 Figure 49. Non-wood forest product categories as a proportion of total reported economic value, 2015
112 Figure 50. Top ten countries for wood removals, 2018
113 Figure 51. Global trends in wood removals, 1961–2018
118 Figure 52. Sample sites for the remote sensing survey
119 Figure 53. Data availability for status and trends, 21 main variables

BOXES

4 Box 1. The Global Forest Resources Assessment online platform
7 Box 2. Global Forest Resources Assessment reporting and the Sustainable Development Goals
13 Box 3. Difference between deforestation and forest area net change
20 Box 4. Seeing the forest and the trees
22 Box 5. Understanding regional differences between products in estimated forest area and tree cover
74 Box 6. Forest certification
89 Box 7. Fire
95 Box 8. Forest degradation
111 Box 9. Wood removals
118 Box 10. Remote sensing survey, 2020
120 Box 11. National forest monitoring tier assessment

Foreword

In September 2015, the world's leaders agreed on the 2030 Agenda for Sustainable Development, including its 17 Sustainable Development Goals. The 2030 Agenda is now guiding the development of policies worldwide aimed at eradicating poverty and hunger, promoting sustained, inclusive and sustainable growth, reducing inequalities, tackling climate change and environmental degradation, and sustainably managing our natural resources.

Forests are at the heart of the 2030 Agenda. They are a source of food, medicines and biofuel for more than 1 billion people. They protect soils and water, host more than three-quarters of the world's terrestrial biodiversity, and help tackle climate change. Forests provide many products and services that contribute to socio-economic development and create work and income for tens of millions of people.

Forests have immense potential to support sustainable development pathways, and the key to realizing this is reliable evidence. Accurate information on forest resources is also needed to monitor progress towards the nationally determined contributions of countries under the Paris Agreement on climate change; the Global Forest Goals and Targets of the United Nations Strategic Plan for Forests 2017–2030; and the forthcoming post-2020 global biodiversity framework and United Nations Decade on Ecosystem Restoration.

FAO completed its first assessment of the world's forest resources in 1948. At that time, its major objective was to collect information on available timber supply to satisfy post-war reconstruction demand. Since then, the Global Forest Resources Assessment (FRA) has evolved into a comprehensive evaluation of forest resources and their condition, management and uses, covering all the thematic elements of sustainable forest management.

This, the latest of these assessments, examines the status of, and trends in, forest resources over the period 1990–2020, drawing on the efforts of hundreds of experts worldwide. The production of FRA 2020 also involved collaboration among many partner organizations, thereby reducing the reporting burden on countries, increasing synergies among reporting processes, and improving data consistency.

The results of FRA 2020 are available in several formats, including this report and an online database containing the original inputs of countries and territories as well as desk studies and regional and global analyses prepared by FAO. I invite you to use these materials to support our common journey towards a more sustainable future with forests.

Maria Helena Semedo

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Deputy Director-General

Acknowledgements

The Global Forest Resources Assessment (FRA) 2020 is the result of a collective effort by the FAO Forestry Department, FAO member countries, institutional and resource partners, and many individuals.

More than 700 people have been directly involved in the FRA 2020 process. They include 342 national correspondents and their alternates and collaborators, who compiled the detailed country reports, and more than 30 external reviewers who, together with FAO experts, supported the national correspondents in obtaining the best-possible quality and consistency in the reports. Ten FAO experts coordinated the FRA 2020 process, including related capacity development, the compilation, review and analysis of data, and preparation of this report.

The FRA 2020 process was supported by two groups of experts: participants in the expert consultation held in Joensuu, Finland, in 2017; and the FRA Advisory Group. The expert consultation provided initial guidance on the scope and reporting content of FRA 2020, and the FRA Advisory Group guided overall implementation.

The Collaborative Forest Resources Questionnaire partners made important contributions to data collection and review. Roman Michalak (Forestry and Timber Section of the United Nations Economic Commission for Europe) and Rastislav Raši (FOREST EUROPE) supported data collection and review for the pan-European countries; they also coordinated the following team of reviewers for those countries: Martin Moravčík, Ivana Pešut, Matej Schwarz, Roksolana Shelest, Venera Surappaeva, Stein Michael Tomter and Mati Valgepea. Adjé Olivier Ahimin (International Tropical Timber Organization) assisted in the preparation and review of reports for francophone African countries. Florence Palla and Donald Jomha Djossi (Central Africa Forest Observatory of the Central African Forest Commission) assisted with the preparation and review of reports for the Central African countries. Lars Gunnar Marklund (Swedish University of Agricultural Sciences) assisted in the data-collection, review, analysis and reporting phases of the FRA 2020 process. Tom Brandeis (United States Forest Service) supported the reporting and review process for the Caribbean English-speaking countries.

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Acronyms and abbreviations

BCEF	biomass conversion and expansion factor
CFRQ	Collaborative Forest Resources Questionnaire
FAO	Food and Agriculture Organization of the United Nations
FRA	Global Forest Resources Assessment
FSC	Forest Stewardship Council
Gt	gigatonne(s)
ha	hectare(s)
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for Conservation of Nature
n.a.	not applicable
NFI	national forest inventory
n.s.	not significant
PEFC	Programme for the Endorsement of Forest Certification
RSS	remote sensing survey
SDG	Sustainable Development Goal
UNFCCC	United Nations Framework Convention on Climate Change

Note that numbers given in the text, tables and figures in this report may not sum to the totals indicated and percentages may not tally to 100 due to rounding. Not all countries reported on all parameters mentioned herein.

Key findings

FORESTS COVER NEARLY ONE-THIRD OF THE LAND GLOBALLY

The world has a total forest area of 4.06 billion hectares (ha), which is 31 percent of the total land area. This area is equivalent to 0.52 ha per person[1] – although forests are not distributed equally among the world's people or geographically. The tropical domain has the largest proportion of the world's forests (45 percent), followed by the boreal, temperate and subtropical domains.

More than half (54 percent) of the world's forests is in only five countries – the Russian Federation, Brazil, Canada, the United States of America and China.

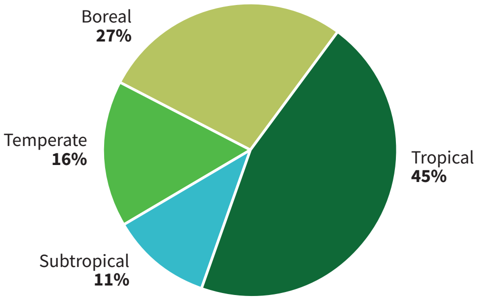
THE WORLD'S FOREST AREA IS DECREASING, BUT THE RATE OF LOSS HAS SLOWED

The world has lost a net area of 178 million ha of forest since 1990, which is an area about the size of Libya.

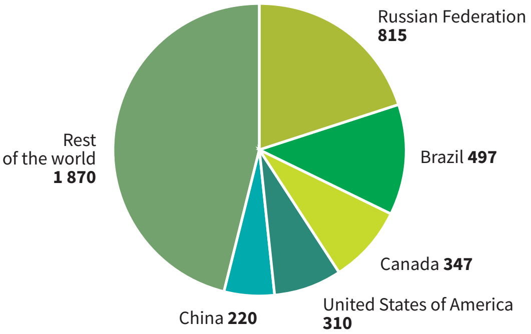
The rate of net forest loss decreased substantially over the period 1990–2020 due to a reduction in deforestation in some countries, plus increases in forest area in others through afforestation and the natural expansion of forests.

The rate of net forest loss declined from 7.8 million ha per year in the decade 1990–2000 to 5.2 million ha per year in 2000–2010 and 4.7 million ha per year in 2010–2020. The rate of decline of net forest loss slowed in the most recent decade due to a reduction in the rate of forest expansion.

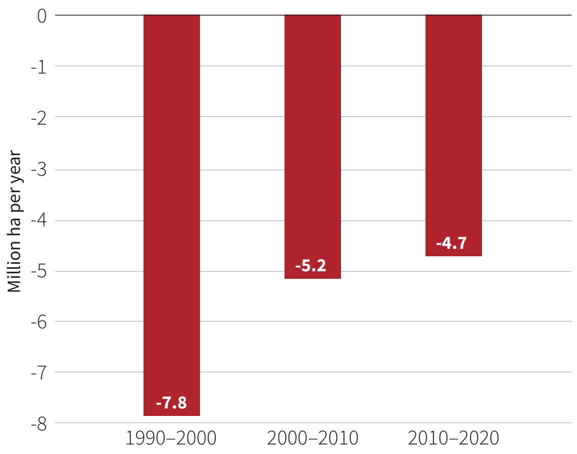
Proportion of global forest area by climatic domain, 2020



Top five countries for forest area, 2020 (million ha)



Global annual forest area net change, by decade, 1990–2020



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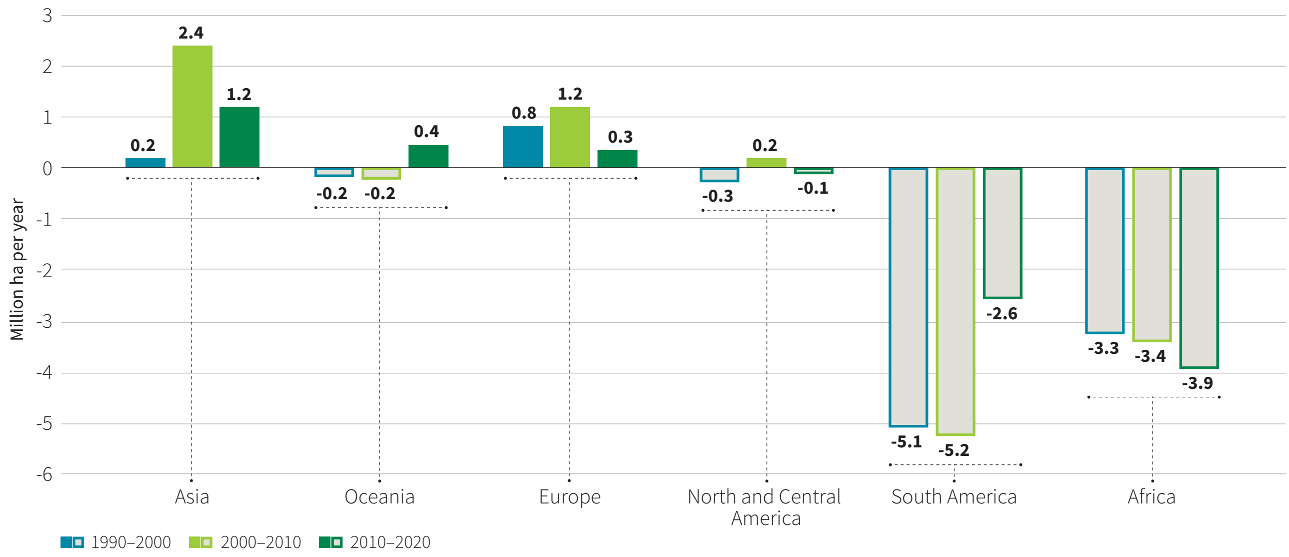
[1] Calculated assuming a global population of 7.79 billion people, as estimated in United Nations, Department of Economic and Social Affairs, Population Division (2019).

Annual forest area net change, by decade and region, 1990–2020



AFRICA HAS THE HIGHEST NET LOSS OF FOREST AREA

Africa had the highest annual rate of net forest loss in 2010–2020, at 3.9 million ha, followed by South America, at 2.6 million ha.

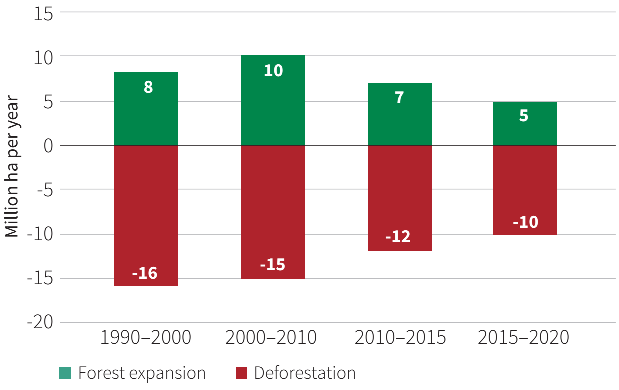
The rate of net forest loss has increased in Africa in each of the three decades since 1990. It has declined substantially in South America, however, to about half the rate in 2010–2020 compared with 2000–2010.

Asia had the highest net gain of forest area in 2010–2020, followed by Oceania and Europe.[2] Nevertheless, both Europe and Asia recorded substantially lower rates of net gain in 2010–2020 than in 2000–2010. Oceania experienced net losses of forest area in the decades 1990–2000 and 2000–2010.

DEFORESTATION CONTINUES, BUT AT A LOWER RATE

An estimated 420 million ha of forest has been lost worldwide through deforestation since 1990, but the rate of forest loss has declined substantially. In the most recent five-year period (2015–2020), the annual rate of deforestation was estimated at 10 million ha, down from 12 million ha in 2010–2015.

Annual rate of forest expansion and deforestation, 1990–2020



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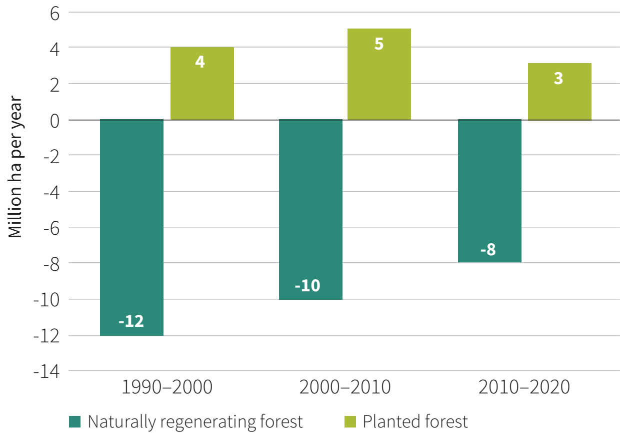
[2] According to the regional breakdown used in FRA 2020, Europe includes the Russian Federation.

MORE THAN 90 PERCENT OF THE WORLD'S FORESTS HAS REGENERATED NATURALLY

Ninety-three percent (3.75 billion ha) of the forest area worldwide is composed of naturally regenerating forests and 7 percent (290 million ha) is planted.

The area of naturally regenerating forest has decreased since 1990 (at a declining rate of loss), but the area of planted forest has increased by 123 million ha. The rate of increase in the area of planted forest has slowed in the last ten years.

Annual net change in area of naturally regenerating and planted forest, by decade, 1990–2020



PLANTATIONS ACCOUNT FOR ABOUT 3 PERCENT OF THE WORLD'S FORESTS

Plantation forests cover about 131 million ha, which is 3 percent of the global forest area and 45 percent of the total area of planted forests.

The highest share of plantation forest is in South America, where this forest type represents 99 percent of the total planted forest area and 2 percent of the total forest area.

The lowest share of plantation forest is in Europe, where it represents 6 percent of the planted forest estate and 0.4 percent of the total forest area.

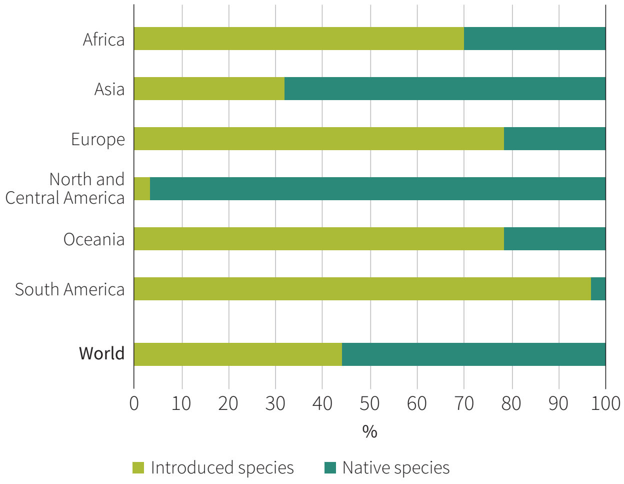
Globally, 44 percent of plantation forests feature introduced species. There are large differences between regions: for example, plantation forests in North and Central America are composed mostly of native species and those in South America consist almost entirely of introduced species.

MORE THAN 700 MILLION HA OF FOREST IS IN LEGALLY ESTABLISHED PROTECTED AREAS

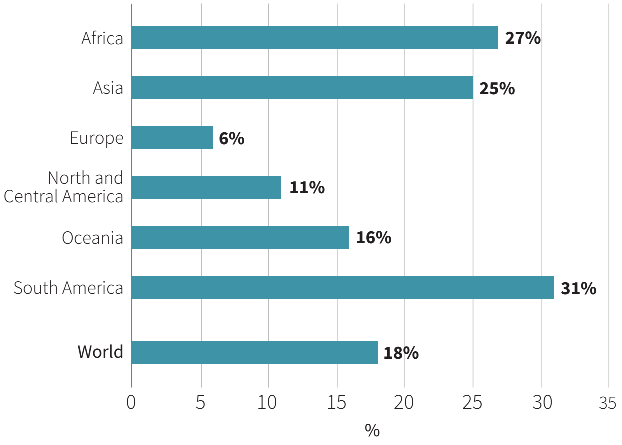
There is an estimated 726 million ha of forest in protected areas worldwide. Of the six world regions, South America has the highest share of forests in protected areas, at 31 percent.

The area of forest in protected areas globally has increased by 191 million ha since 1990, but the rate of annual increase slowed in 2010–2020.

Proportion of introduced and native species in plantation forest, by region, 2020



Proportion of forest in protected areas, by region, 2020



PRIMARY FORESTS COVER ABOUT 1 BILLION HA

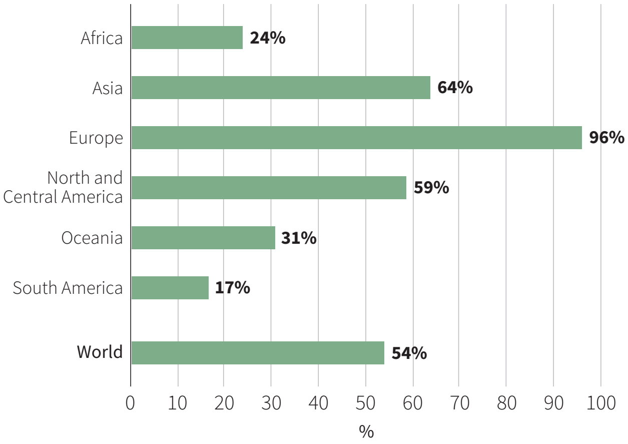
The world still has at least 1.11 billion ha of primary forest – that is, forests composed of native species in which there are no clearly visible indications of human activity and the ecological processes have not been significantly disturbed. Combined, three countries – Brazil, Canada and the Russian Federation – host more than half (61 percent) of the world's primary forest.

The area of primary forest has decreased by 81 million ha since 1990, but the rate of loss more than halved in 2010–2020 compared with the previous decade.

MORE THAN 2 BILLION HA OF FOREST HAS MANAGEMENT PLANS

Most of the forests in Europe have management plans; on the other hand, management plans exist for less than 25 percent of forests in Africa and less than 20 percent in South America. The area of forest under management plans is increasing in all regions – globally, it has grown by 233 million ha since 2000, reaching 2.05 billion ha in 2020.

Proportion of forest area with long-term management plans, by region, 2020



FIRE IS A PREVALENT FOREST DISTURBANCE IN THE TROPICS

Forests face many disturbances that can adversely affect their health and vitality and reduce their ability to provide a full range of goods and ecosystem services. About 98 million ha of forest was affected by fire in 2015;[3] this was mainly in the tropical domain, where fire burned about 4 percent of the total forest area in that year. More than two-thirds of the total forest area affected was in Africa and South America.

Insects, disease and severe weather events damaged about 40 million ha of forests in 2015, mainly in the temperate and boreal domains.

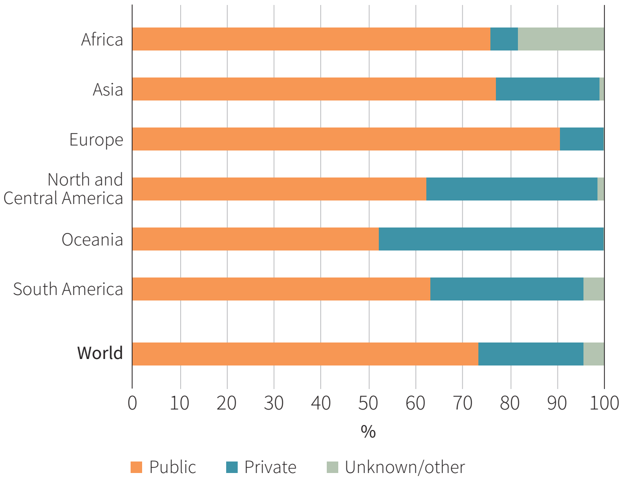
THE WORLD'S FORESTS ARE MOSTLY PUBLICLY OWNED, BUT THE SHARE OF PRIVATELY OWNED FORESTS HAS INCREASED SINCE 1990

Seventy-three percent of the world's forests is under public ownership,[4] 22 percent is privately owned, and the ownership of the remainder is categorized as either "unknown" or "other" (the latter mainly comprising forests where ownership is disputed or in transition).

Public ownership is predominant in all regions and most subregions. Of the regions, Oceania, North and Central America and South America have the highest proportions of private forests.

Globally, the share of publicly owned forests has decreased since 1990 and the area of forest under private ownership has increased.

Forest ownership by region, 2015



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[3] The latest year for which global data are available.
[4] As of 2015, the latest year for which global data are available.

Public administrations hold management rights to 83 percent of the publicly owned forest area globally. Management by public administrations is particularly predominant in South America, where it accounts for 97 percent of management responsibility in publicly owned forests. The share of public administration management rights has decreased globally since 1990, with an increasing share of publicly owned forests managed by business entities and institutions and by indigenous and tribal communities.

THE WORLD'S FOREST GROWING STOCK IS DECLINING

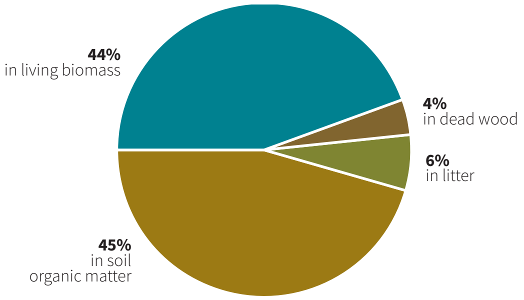
The world's total growing stock of trees decreased slightly, from 560 billion m^3 in 1990 to 557 billion m^3 in 2020, due to a net decrease in forest area. On the other hand, growing stock is increasing per unit area globally and in all regions; it rose from 132 m^3 per ha in 1990 to 137 m^3 per ha in 2020. Growing stock per unit area is highest in the tropical forests of South and Central America and West and Central Africa.

The world's forests contain about 606 gigatonnes of living biomass (above- and below-ground) and 59 gigatonnes of dead wood. The total biomass has decreased slightly since 1990, but biomass per unit area has increased.

TOTAL FOREST CARBON STOCK IS DECREASING

Most forest carbon is found in the living biomass (44 percent) and soil organic matter (45 percent), with the remainder in dead wood and litter. The total carbon stock in forests decreased from 668 gigatonnes in 1990 to 662 gigatonnes in 2020; carbon density increased slightly over the same period, from 159 tonnes to 163 tonnes per ha.

Proportion of carbon stock in forest carbon pools, 2020



ABOUT 30 PERCENT OF ALL FORESTS IS USED PRIMARILY FOR PRODUCTION

Globally, about 1.15 billion ha of forest is managed primarily for the production of wood and non-wood forest products. In addition, 749 million ha is designated for multiple use, which often includes production.

Worldwide, the area of forest designated primarily for production has been relatively stable since 1990, but the area of multiple-use forest has decreased by about 71 million ha.

ABOUT TEN PERCENT OF THE WORLD'S FORESTS IS ALLOCATED FOR BIODIVERSITY CONSERVATION

Globally, 424 million ha of forest is designated primarily for biodiversity conservation. In total, 111 million ha has been so designated since 1990, of which the largest part was allocated between 2000 and 2010. The rate of increase in the area of forest designated primarily for biodiversity conservation has slowed in the last ten years.

THE AREA OF FOREST DESIGNATED PRIMARILY FOR SOIL AND WATER PROTECTION IS INCREASING

An estimated 398 million ha of forest is designated primarily for the protection of soil and water, an increase of 119 million ha since 1990. The rate of increase in the area of forest allocated for this purpose has grown over the entire period but especially in the last ten years.

MORE THAN 180 MILLION HA OF FOREST IS USED MAINLY FOR SOCIAL SERVICES

An area of 186 million ha of forest worldwide is allocated for social services such as recreation, tourism, education research and the conservation of cultural and spiritual sites. The area designated for this forest use has increased at a rate of 186 000 ha per year since 2010.

* * *

1

Introduction

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Since its creation, the Food and Agriculture Organization of the United Nations (FAO) has, at the request of its member countries, regularly collected, analysed and disseminated information on the status of and trends in the world's forest resources through the Global Forest Resources Assessment (FRA).

The scope, methodology and periodicity of FRAs have evolved over time in response to changing information needs. Early assessments were mainly FAO-driven processes focused on timber availability; later assessments have been country-driven, with a more holistic perspective (FAO, 2018a). Since 2005, FRAs have relied on country data provided by a well-established network of officially nominated national correspondents.

As FRAs have evolved to become more comprehensive, the amount of information requested from members has increased substantially. In the past, the reporting burden on countries was exacerbated by requests for the same or similar data from other forest-related reporting processes. Starting from FRA 2005, however, FAO's FRA secretariat has collaborated with other international reporting processes and organizations involved in the collection of forest-related data, and it has worked with members of the Collaborative Partnership on Forests to improve definitions and streamline reporting. This approach led to the establishment of the Collaborative Forest Resources Questionnaire (CFRQ),[5] which was used in the production of FRA 2015. In consultation with countries and international experts, the FRA secretariat also reviewed the scope of assessments with the aim of avoiding overlaps with other data-collection processes and further reducing the reporting burden.

FRA 2020 has continued on this path, with adaptations to its scope and reporting periodicity to better respond to recent developments in international forestry. For the first time since FRA 2000, the number of variables has been reduced (to about 60 broad categories), and an online platform has been put in place to facilitate reporting. This platform also serves to increase transparency, the reliability of results, and the accessibility and usability of data for end users (Box 1).

Process

Preparations for FRA 2020 began with an internal evaluation of FRA 2015 and an online user survey, which helped determine the scope and reporting content of FRA 2020. Scope and content were also addressed in consultations with various teams in the FAO Forestry Department, the FRA Advisory Group,[6] CFRQ partners and the FAO/United Nations Economic Commission for Europe Team of Specialists on Monitoring Sustainable Forest Management. The Seventh Expert Consultation on FRA, held in Joensuu, Finland, in June 2017, concluded this consultation cycle and provided important inputs into the scope and reporting content of FRA 2020 (Luke, 2017). The recommendations of the Seventh Expert Consultation focused on developing the capacity of FRA to provide timely responses to information requirements while also further reducing the reporting burden on countries. The agenda of that meeting reflected significant recent developments in international forest policy, including the Paris Agreement on climate change, the Sustainable Development Goals (SDGs) (Box 2, p. 7),

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[5] In 2011, FAO, the International Tropical Timber Organization, FOREST EUROPE, the United Nations Economic Commission for Europe, the Observatory of Central African Forests and the countries of the Montréal Process combined to create the CFRQ. This joint questionnaire was established with the aim of reducing the reporting burden on countries and increasing data consistency across organizations through standardized definitions and the common timing of data collection.

[6] The FRA Advisory Group was established in 2002 on the recommendation of an expert consultation in Kotka, Finland. The FRA Advisory Group is informal in nature, but it is recognized by FAO's Committee on Forestry, which generally endorses its recommendations. The group has a long-term commitment to meet annually. Its role is to review FRA activities and outputs and to make recommendations aimed at strengthening existing institutional networks and making future FRAs more user-oriented and demand-driven and more closely linked with other international processes.

Box 1. The Global Forest Resources Assessment online platform

Evaluations of previous Global Forest Resources Assessments (FRAs) identified a need for an online tool to facilitate reporting and the dissemination of results to end users. The FRA 2020 online platform aims to:

- **Increase transparency** – the platform contains all the documentation necessary for understanding how the reported figures were produced, including original data sources, definitions, and the methodologies applied to convert national figures to FRA estimates.
- **Ensure ease of use** – the platform has an intuitive interface enabling easy data entry, copying and pasting from existing datasheets, and the uploading of existing documentation.
- **Add value** – the platform expedites reporting and guarantees consistency in reported values.
- **Improve communication** – the platform enables a transparent review process and facilitates communication between countries and reviewer teams.
- **Improve dissemination** – the platform provides easy access to country-reported data and summary information.

For countries that lack inventory and monitoring systems capable of producing annual data, the platform is a useful tool for generating consistent interpolations and extrapolations of data and provides a transparent mechanism for reviewing data and updating them. To facilitate the reporting process, especially for countries where forest information is limited or unavailable, the platform enables access to previous country reports as well as freely available geospatial data derived from remote sensing.

The platform stores all the information and data provided by countries and territories, which will substantially expedite future reporting.

The platform makes a significant contribution to the implementation of the 2030 Agenda for Sustainable Development and to reporting on the forest-related indicators of the Sustainable Development Goals (SDGs), which was initiated in 2016 and will continue annually. In addition to the SDGs, the platform serves as a common reporting tool for other partners of the Collaborative Forest Resources Questionnaire. For example, the platform has been used to collect data for pan-European reporting on indicators of sustainable forest management in collaboration with FOREST EUROPE and the United Nations Economic Commission for Europe.

TABLE 1. Key milestones in the development of the Global Forest Resources Assessment 2020

Milestone/activity	Date	Comment
Global meeting of national correspondents	March 2018	Launch of the Global Forest Resources Assessment (FRA) 2020 process. Training of national correspondents and work on key variables for reporting on the Sustainable Development Goals
Deadline for submission of draft country reports	Ten days before regional/subregional workshops	Draft country reports submitted for first review at least ten days before participation in regional/subregional workshops
Regional/subregional workshops	April 2018–December 2018	Technical assistance and review of draft country reports
Official validation of final country reports	September 2019	Official request for validation of final country reports sent to national authorities
Release of FRA 2020 key findings	May 2020	Key results of FRA 2020
Launch of FRA 2020 main report	Second half of 2020	Full results, country reports and database published at the 25th Session of the FAO Committee on Forestry

and the United Nations Strategic Plan for Forests 2017–2030,[7] all of which have set new demands for the FRA process in terms of both scope and periodicity.

The FRA 2020 country reporting process started with a technical meeting in Toluca, Mexico, in March 2018 (Table 1 shows key milestones in the process). This meeting brought together nearly 160 participants from more than 90 countries, including national correspondents, representatives of the CFRQ, and members of the FRA Advisory Group. At the meeting, national correspondents familiarized themselves with all aspects of the reporting process.

Throughout the reporting phase, Regional FRA focal points were in regular contact with the national correspondents and their teams to provide technical support on the reporting tables, the analysis and interpretation of national data, and the use of the online reporting platform.

Nine regional and subregional workshops were organized in April–December 2018 to further support countries in compiling and finalizing the FRA 2020 country reports (FAO, undated). These workshops provided a forum in which national correspondents could share their experiences with colleagues from other countries.

National correspondents submitted their country reports, once compiled, through the online platform for technical review. In this review, the draft country reports underwent detailed checks to ensure completeness and the correct application of definitions and methodologies. Internal consistency was checked and a comparison made with information provided for FRA 2015 and with other published information sources. Around 30 experts from among FAO staff, CFRQ partners and other international bodies contributed to the review process. A final validation phase was conducted to officially inform the heads of forestry of each country of the contents of the report and to request their clearance for publication on a no-objection basis.

Scope

FRA 2020 examines the status and trends of around 60 broad categories (under seven main topics) in the period 1990–2020. The backbone of the assessment are data reported through standardized country reports, which were compiled by officially nominated national correspondents through an online platform, as described above.

Each country report contains 22 reporting tables organized around the following main topics: forest extent and characteristics; growing stock, biomass and carbon; designation and management objectives; ownership and management rights; disturbances; policies and legislation; and employment, education and non-wood forest products. Annex 1 summarizes data for variables at the global and regional levels, and Annex 2 presents data on forest area for all countries and territories.

For each reporting table, countries were requested to provide full references for original data, describe the methodologies used for estimation, forecasting and reclassification, and explain any assumptions made.

A total of 236 countries and territories are included in FRA 2020, based on the list used by the United Nations Statistics Division (United Nations Statistics Division, undated). The following listed units were excluded from FRA 2020 unless otherwise indicated:

- Åland Islands (included under Finland in FRA 2020)
- British Indian Ocean Territory
- Channel Islands (listed separately as Guernsey and Jersey)
- China, Hong Kong SAR (included under China)
- China, Macao SAR (included under China)
- Christmas Island
- Cocos (Keeling) Islands
- French Southern Territories
- Heard and McDonald Islands
- South Georgia and the South Sandwich Islands
- United States Minor Outlying Islands.

The Netherlands Antilles, reported as a single entity in FRA 2015, is reported in FRA 2020 as Bonaire, Sint Eustatius and Saba, Curaçao and Sint Maarten (Dutch part).

The regional and subregional groupings are those used in previous FRAs (Figure 1).

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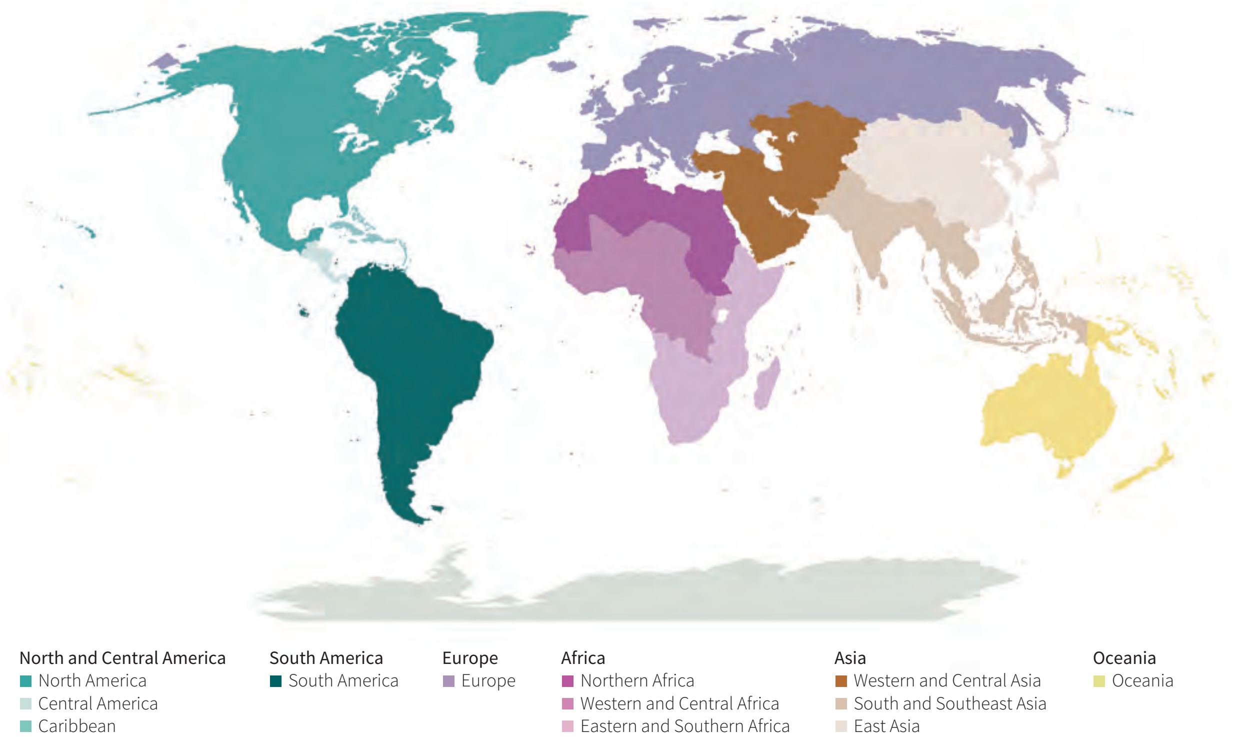
[7] The United Nations Strategic Plan for Forests 2017–2030 provides a global framework for action at all levels to sustainably manage all types of forests and trees outside forests, and to halt deforestation and forest degradation. The plan was agreed at a special session of the United Nations Forum on Forests in January 2017 and subsequently adopted by the United Nations General Assembly in April 2017.

FIGURE 1. Regional and subregional breakdown used in the Global Forest Resources Assessment 2020


North and Central America
North America
Central America
Caribbean
South America
South America
Europe
Europe
Africa
Northern Africa
Western and Central Africa
Eastern and Southern Africa
Asia
Western and Central Asia
South and Southeast Asia
East Asia
Oceania
Oceania

Source: Adapted from United Nations World map, 2020.

Data analysis

Data submitted by countries through the online platform were stored in a database for easy retrieval and analysis. Forty-seven desk studies, representing 0.5 percent of the total forest area, were prepared for countries and territories that did not submit reports.

National data were aggregated to derive subregional, regional and global estimates. Trend estimates generally only include countries that reported complete time series (although, in some cases, gap-filling was performed for missing values to obtain complete time series for estimates of trends). It is not always possible, therefore, to reproduce the estimates of global, regional and subregional aggregates presented in this report by aggregating the reported country data.

This report presents the findings of the data analysis, comprising the status of and main trends in each variable.

Outputs

In addition to this main report, outputs of FRA 2020 include:

- 236 country and territory reports, each in the language of official correspondence (English, French, Russian or Spanish);
- an interactive database with the complete FRA 2020 dataset;
- key findings (a summary of the FRA 2020 main findings at the global and regional levels in English, French and Spanish);
- FRA working papers, including on the FRA 2020 terms and definitions, FRA 2020 guidelines and specifications, and workshop reports; and
- scientific papers and special studies using FRA 2020 data, produced in collaboration with partner institutions and international experts (in preparation).

All FRA-related materials are available at www.fao.org/forest-resources-assessment.

Box 2. Global Forest Resources Assessment reporting and the Sustainable Development Goals

The 193 member states of the United Nations adopted the 17 Sustainable Development Goals (SDGs) of the 2030 Agenda for Sustainable Development in September 2015. The SDGs are global objectives expected to guide the actions of the international community between 2016 and 2030. A global indicator framework, which includes 232 indicators, was agreed in March 2017. Forests are important in several of the SDGs. In particular, SDG 15 – "life on land" – emphasizes the importance of forests for the sustainability of terrestrial ecosystems (Figure 2). FAO is the designated United Nations custodian agency for 21 SDG indicators and a contributing agency for another five. Three of these indicators are under SDG 15, and data for two of these are collected and reported through the Global Forest Resources Assessment.

Indicator 15.1.1 ("forest area as a proportion of total land area") is derived directly by dividing the forest area reported by countries and territories to FRA by the official land area of each country and territory in 2015 (as reported to FAOSTAT); Figure 3 shows the indicator values, by region, for 2000, 2010, 2015 and 2020.

Indicator 15.2.1 ("progress towards sustainable forest management") is more difficult to measure because there is no single quantifiable and measurable characteristic that fully encompasses the many dimensions of sustainable forest management. FAO worked with partners to develop a methodology for reporting, and a set of five subindicators was established to measure progress towards the economic, social and environmental dimensions of sustainable forest management.

The five subindicators are:

1. Forest area annual net change rate
2. Above-ground biomass stock in forest
3. Proportion of forest area located within legally established protected areas
4. Proportion of forest area under long-term forest management plans
5. Forest area under independently verified forest management certification schemes.

Subindicators 1–3 address the environmental values of forests, focusing on changes in forest area over time, biomass stored in forest, and actions taken to protect and maintain biodiversity and other natural and cultural resources. Subindicators 4 and 5 address all dimensions of sustainable forest management, including economic and social aspects.

The existence of forest management plans indicates the intention to manage the forests for long-term purposes. The area of certified forest provides information on the area of forest in which management complies with national or international standards, including independent verification.

Data on subindicators 1–4 are collected through the FRA country reporting process, and data for subindicator 5 are obtained from the main certification bodies (Box 6, p. 74). Detailed definitions and methodologies for each indicator and subindicator are available in the SDG metadata repository.[8]

At the regional and global levels, "traffic lights" are used to indicate, for each subindicator, whether the situation is stable, improving or deteriorating (Figure 4).

Figure 2. Sustainable Development Goal 15, and relevant targets

SDG 15	Targets*	Indicators reported through FRA
Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss	15.1: By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements	**15.1.1: Forest area as a proportion of total land area**
	15.2: By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally	**15.2.1: Progress towards sustainable forest management**

** The full set of targets and indicators under SDG 15 is available at www.un.org/sustainabledevelopment/biodiversity.*

(Continued)

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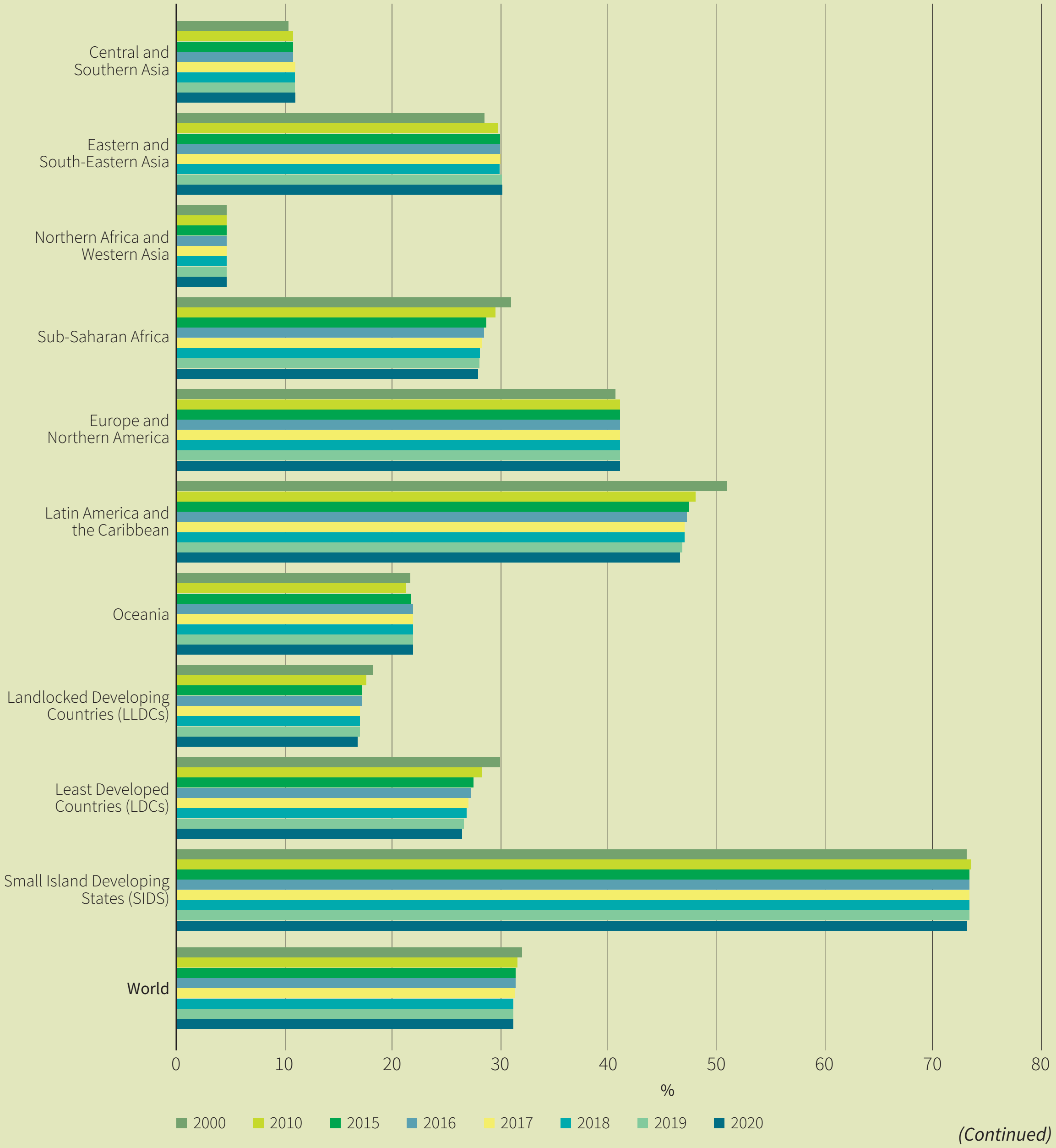
[8] The SDG indicators metadata repository is available at https://unstats.un.org/sdgs/metadata.

Box 2. *(Continued)*

FAO has reported data for these indicators and subindicators to the SDG secretariat annually since 2017. Reports up to 2019 were based on data from FRA 2015; from 2020 they will be based on FRA 2020, with updates from countries as new data become available.

Figure 3. Forest area as a proportion (%) of total land area, 2000, 2010 and 2015–2020, by Sustainable Development Goal regional grouping



(Continued)

Box 2. *(Continued)*

Figure 4. Traffic-light dashboard for subindicators of indicator 15.2.1, 2020

SDG Region	Forest area annual net change rate[1]	Above-ground biomass stock in forest (t/ha)	Proportion of forest area within legally established protected areas	Proportion of forest area under a long-term forest management plan	Forest area certified[2]
WORLD	🔵	🟢	🟢	🟢	🟢
Central and Southern Asia	🟢	🔵	🟢	🟢	🟢
Central Asia	🟢	🟢	🟢	🟢	⚫
Southern Asia	🟢	🔵	🟢	🔵	🟢
Eastern and South-Eastern Asia	🟢	🟢	🟢	🟢	🟢
Eastern Asia	🟢	🟢	🟢	🟢	🟢
South-Eastern Asia	🔴	🔵	🟢	🟢	🟢
Northern Africa and Western Asia	🔴	🟢	🟢	🟢	🟢
Northern Africa	🔴	🔵	🔵	🟢	🔴
Western Asia	🟢	🟢	🟢	🟢	🟢
Sub-Saharan Africa	🔴	🔵	🟢	🟢	🔴
Europe and Northern America	🟢	🟢	🟢	🟢	🟢
Europe	🟢	🟢	🟢	🔵	🟢
Northern America	🟢	🟢	🟢	🟢	🟢
Latin America and the Caribbean	🔵	🟢	🟢	🟢	🟢
Oceania	🟢	🔴	🟢	🔵	🟢
Oceania (exc. Australia and New Zealand)	🔵	🔵	🟢	🔵	🟢
Australia and New Zealand	🟢	🔴	🟢	🔵	🟢
Landlocked Developing Countries (LLDCs)	🔴	🔵	🟢	🟢	🔴
Least Developed Countries (LDCs)	🔴	🔵	🟢	🟢	🟢
Small Island Developing States (SIDS)	🔴	🔵	🟢	🟢	🟢

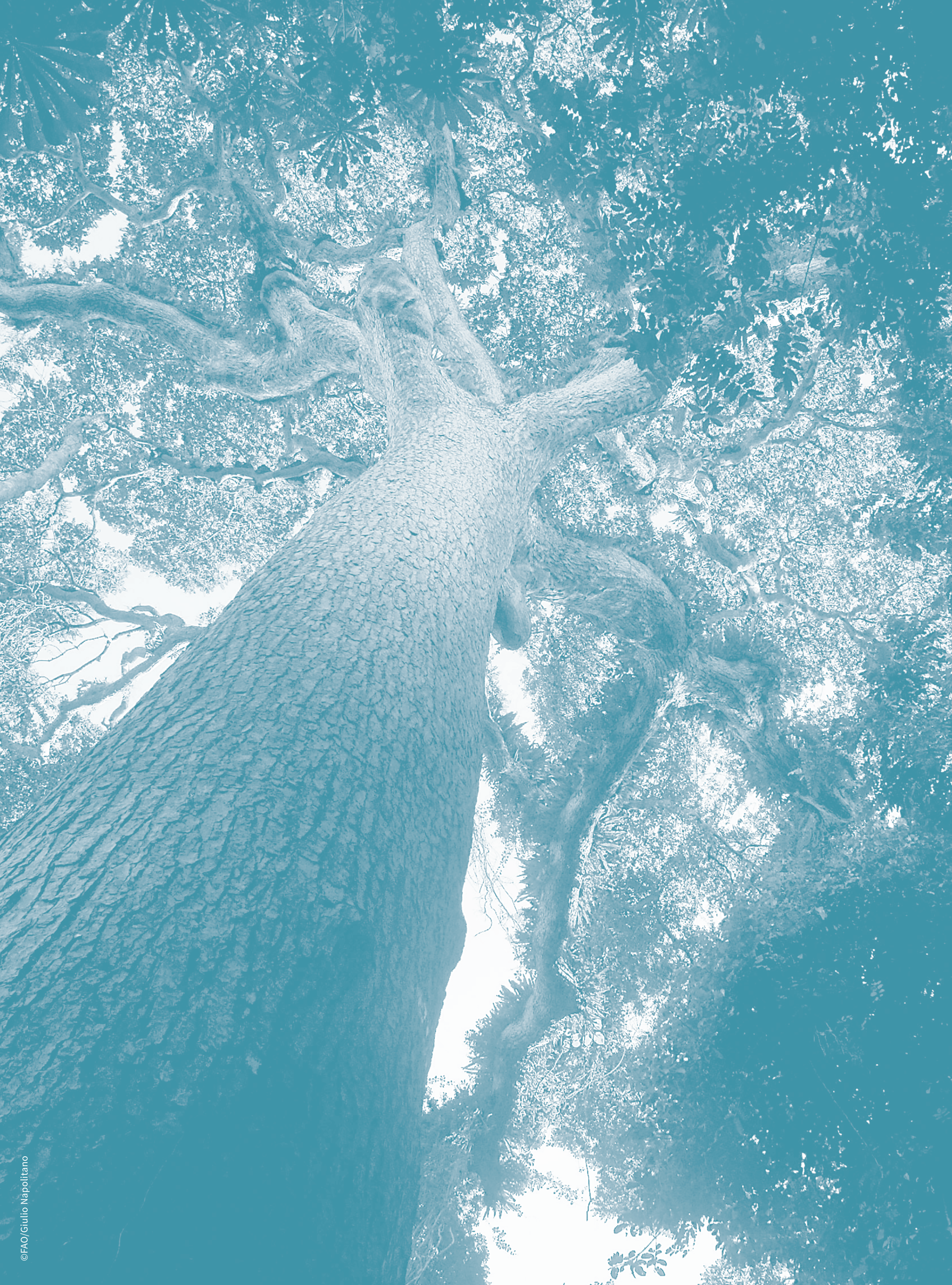
🟢 Positive change 🔵 No/small change 🔴 Negative change ⚫ No certified areas

[1] Calculated as the compound annual change rate.

[2] Includes areas certified under the Forest Stewardship Council and the Programme for the Endorsement of Forest Certification.

2

Forest extent and changes



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Forests are crucial resources for addressing SDGs related to sustainable production and consumption, poverty alleviation, food security, biodiversity conservation and climate change. The benefits of forests go well beyond forest boundaries and help maintain suitable conditions for life on Earth. Monitoring the extent and other aspects of the world's forests assists in identifying and amending unsustainable practices and in restoring and rehabilitating degraded forest landscapes.

Box 3. Difference between deforestation and forest area net change

Deforestation is the conversion of forest to other land uses, such as agriculture and infrastructure. On the other hand, forest area can increase when trees are planted on land that was not previously forested ("afforestation") or when trees grow back on abandoned agricultural or other land ("natural forest expansion").

Over a given period, the sum of all losses due to deforestation and all gains due to afforestation and natural forest expansion results in forest area net change. Depending on whether forest expansion or deforestation prevails, forest area net change can be positive, meaning there has been an overall gain in forest area, or negative, meaning an overall loss of forest area. Thus:

Forest area net change =
∑ gains (forest expansion) – ∑ losses (deforestation)

The difference between forest area net change and deforestation is that the former is the result of all losses and gains and the latter takes into account only the area of forest that has been converted to other land uses. In FRA 2020, the net change in forest area was calculated as the difference in forest area between two points in time.

Information on forest area and the way it changes over time is essential for measuring progress towards the SDGs. Forests feature in the SDGs because of their significant contributions to food security and livelihoods and for the many products and ecosystem services they provide. SDG 15 ("life on land"), in particular, puts forests at the centre of the sustainability of terrestrial ecosystems, aiming to "protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss".

Changes in forest area over time reflect changes in demand for land for other uses. But, on its own, this parameter is insufficient to describe and explain complex land-use dynamics. Additional information is needed to understand how much forest has been lost due to conversion to other land uses and how much has been gained due to natural expansion and afforestation.

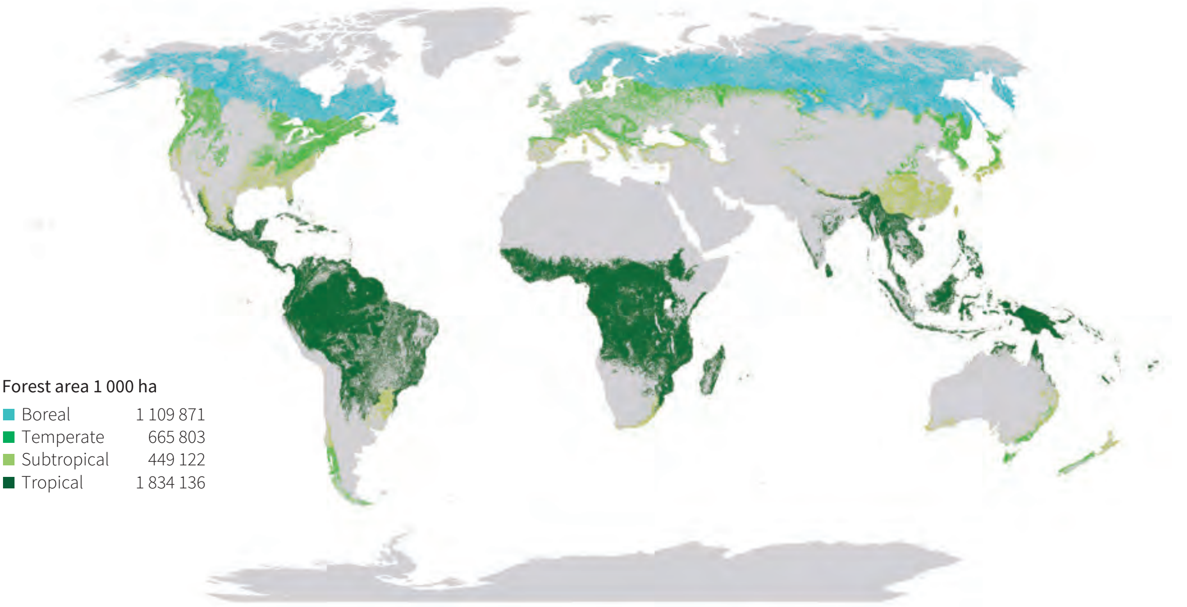
This chapter provides insight into such dynamics, presenting estimates of both deforestation and net forest area change at the regional and global levels (Box 3). It also provides data on two non-forest categories, "other wooded land" and "other land with tree cover", both of which are important resources in many countries.

Forest area

STATUS

FRA 2020 received data (or, for desk studies, made estimates based on available information) on forest area in 2020 for all 236 countries and territories included in the assessment. The global average of the reference years for the data used to estimate forest area for 2020 is 2011. Estimates for countries with large forest areas, however, are mostly based on more recent data; thus, 2015 is the weighted average reference year for forest area. In total, 143 countries and territories encompassing 80 percent of the world's total forest area based their forest-area estimates for 2020 on data published in 2013 or later. The availability of new data not only increases the reliability of forest-area estimates for 2020; in most cases

FIGURE 5. The global distribution of forests, by climatic domain



Source: Adapted from United Nations World map, 2020.

TABLE 2. Forest area, by region and subregion, 2020

Region/subregion	Forest area	
	1 000 ha	% of world forest area
Eastern and Southern Africa	295 778	7
Northern Africa	35 151	1
Western and Central Africa	305 710	8
Total Africa	**636 639**	**16**
East Asia	271 403	7
South and Southeast Asia	296 047	7
Western and Central Asia	55 237	1
Total Asia	**622 687**	**15**
Europe excl. Russian Federation	202 150	5
Total Europe	**1 017 461**	**25**
Caribbean	7 889	0
Central America	22 404	1
North America	722 417	18
Total North and Central America	**752 710**	**19**
Total Oceania	**185 248**	**5**
Total South America	**844 186**	**21**
WORLD	**4 058 931**	**100**

it also improves trend estimates derived from historical and previously reported data. In most cases, data from 2013 or later were unavailable for FRA 2015; their availability for FRA 2020 explains differences in forest-area estimates in FRA 2015 and FRA 2020 for the same reference years.

The global forest area in 2020 is estimated at 4.06 billion ha, which is 31 percent of the total land area. This area is equivalent to 0.52 ha of forest per capita,[9] although forests are not distributed equally among the world's people or geographically. Forty-five percent of the world's forests are in the tropical domain, followed by the boreal (27 percent), temperate (16 percent) and subtropical (11 percent) domains (Figure 5). Table 2 shows the distribution of forest area at the regional and subregional levels. Europe accounts for 25 percent of the world's forest area, followed by South America (21 percent), North and Central America (19 percent), Africa (16 percent), Asia (15 percent) and Oceania (5 percent).

More than half (54 percent) of the world's forest area is in only five countries – the Russian Federation, Brazil, Canada, the United States of America and China. The ten countries with the largest forest area account for about two-thirds (66 percent) of the world total (Table 3).

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[9] Calculated assuming a global population of 7.79 billion people, as estimated by United Nations, Department of Economic and Social Affairs, Population Division (2019).

TABLE 3. Top ten countries for forest area, 2020

Ranking	Country	Forest area		
		1 000 ha	% of world forest area	% cumulative
1	Russian Federation	815 312	20	20
2	Brazil	496 620	12	32
3	Canada	346 928	9	41
4	United States of America	309 795	8	49
5	China	219 978	5	54
6	Australia	134 005	3	57
7	Democratic Republic of the Congo	126 155	3	60
8	Indonesia	92 133	2	63
9	Peru	72 330	2	64
10	India	72 160	2	66

Eight countries and territories – the Falkland Islands (Malvinas),[10] Gibraltar, Holy See, Monaco, Nauru, Qatar, Svalbard and Jan Mayen Islands, and Tokelau – have no forest at all. Another 50 countries and territories have forest on less than 10 percent of their total land areas. Table 4 shows the top ten countries and territories for forest area as a percentage of total land area; among those, the value is 90 percent or above in seven countries (Figure 6).

TRENDS

Trends in forest area were estimated for all 236 countries and territories in the assessment. They were analysed over a 30-year period divided into three decades: 1990–2000, 2000–2010 and 2010–2020. Note that, although reporting on forest area has generally improved, relatively few countries and territories have reliable data over the period, and the trends discussed below should be treated with caution.

The global forest area declined by about 178 million ha (an area approximately the size of Libya) in the 30 years from 1990 to 2020 (Table 5). The rate of net forest loss has decreased since 1990, a result of reduced deforestation in some countries and forest gains in others. The annual net loss of forest area declined from 7.84 million ha in 1990–2000, to 5.17 million ha in 2000–2010, to 4.74 million in 2010–2020 (Table 6 and Figure 6 show this parameter by region and subregion). The rate of decline of net forest loss in the most recent decade was due mainly to a reduction in the rate of forest gain (i.e. afforestation and the natural expansion of forests).

TABLE 4. Top ten countries and territories for forest area as a percentage of total land area, 2020

Ranking	Country	Forest area	
		1 000 ha	% of total land area
1	Suriname	15 196	97
2	French Guyana	8 003	97
3	Guyana	18 415	94
4	Micronesia (Federated States of)	64	92
5	Gabon	23 531	91
6	Solomon Islands	2 523	90
7	Palau	41	90
8	Equatorial Guinea	2 448	87
9	American Samoa	17	86
10	Papua New Guinea	35 856	79

Africa had the highest net loss of forest area in the decade to 2020, with Eastern and Southern Africa and Western and Central Africa accounting for most of the losses. There has been an increase in the average annual rate of net forest loss in Africa since 1990, from 3.28 million ha in 1990–2000, to 3.40 million ha in 2000–2010, to 3.94 million ha in the most recent decade. The increase in the rate over the period was most evident in Eastern and Southern Africa, where it grew from 1.35 million ha per year in the 1990s to 1.91 million ha per year in 2010–2020.

South America had the second-highest average annual rate of net forest loss in 2010–2020, at 2.60 million ha, although this was less than half the rate in 2000–2010 (5.25 million ha). The regional trend mostly reflects changes

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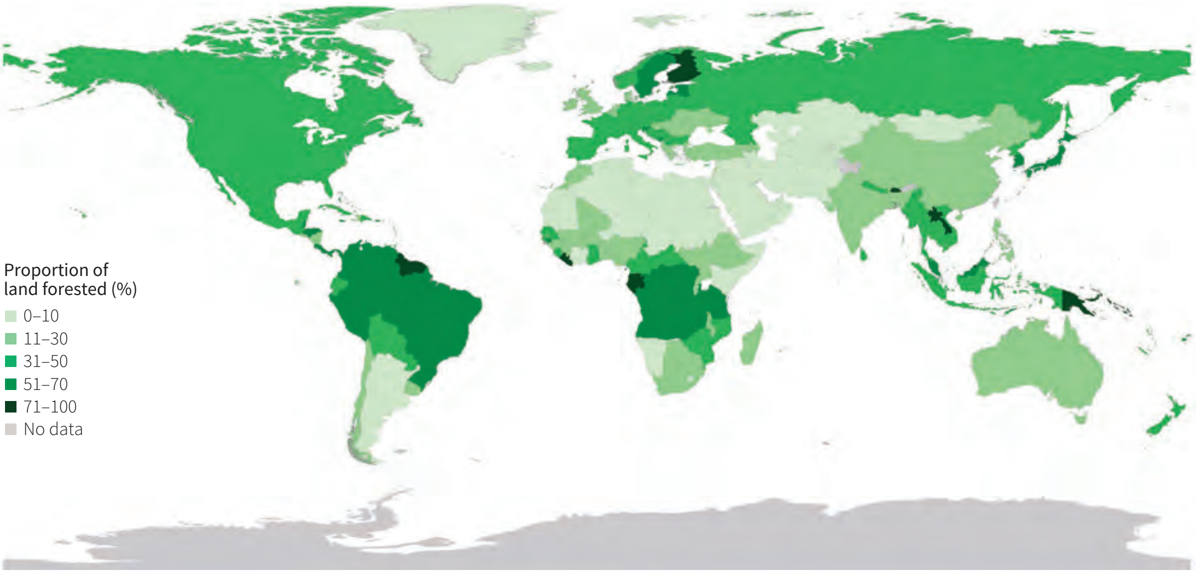
[10] A dispute exists between the Government of Argentina and the Government of the United Kingdom of Great Britain and Northern Ireland concerning sovereignty over the Falkland Islands (Malvinas).

FIGURE 6. Forest area as a percentage of total land area, 2020



Source: Adapted from United Nations World map, 2020.

TABLE 5. Forest area, by region and subregion, 1990–2020

Region/subregion	Forest area (1 000 ha)			
	1990	2000	2010	2020
Eastern and Southern Africa	346 034	332 580	314 849	295 778
Northern Africa	39 926	38 104	36 833	35 151
Western and Central Africa	356 842	339 365	324 333	305 710
Total Africa	**742 801**	**710 049**	**676 015**	**636 639**
East Asia	209 906	229 071	252 390	271 403
South and Southeast Asia	326 511	308 077	305 461	296 047
Western and Central Asia	48 976	50 262	53 109	55 237
Total Asia	**585 393**	**587 410**	**610 960**	**622 687**
Europe excl. Russian Federation	185 369	193 000	198 847	202 150
Total Europe	**994 319**	**1 002 268**	**1 013 982**	**1 017 461**
Caribbean	5 961	6 808	7 497	7 889
Central America	28 002	25 819	23 706	22 404
North America	721 317	719 721	722 987	722 417
Total North and Central America	**755 279**	**752 349**	**754 190**	**752 710**
Total Oceania	**184 974**	**183 328**	**181 015**	**185 248**
Total South America	**973 666**	**922 645**	**870 154**	**844 186**
WORLD	**4 236 433**	**4 158 050**	**4 106 317**	**4 058 931**

TABLE 6. Annual average net change in forest area, by region and subregion, 1990–2020

Region/subregion	Forest area annual change					
	1990–2000		2000–2010		2010–2020	
	1 000 ha/yr	%	1 000 ha/yr	%	1 000 ha/yr	%
Eastern and Southern Africa	-1 345	-0.40	-1 773	-0.55	-1 907	-0.62
Northern Africa	-182	-0.47	-127	-0.34	-168	-0.47
Western and Central Africa	-1 748	-0.50	-1 503	-0.45	-1 862	-0.59
Total Africa	**-3 275**	**-0.45**	**-3 403**	**-0.49**	**-3 938**	**-0.60**
East Asia	1 917	0.88	2 332	0.97	1 901	0.73
South and Southeast Asia	-1 843	-0.58	-262	-0.09	-941	-0.31
Western and Central Asia	129	0.26	285	0.55	213	0.39
Total Asia	**202**	**0.03**	**2 355**	**0.39**	**1 173**	**0.19**
Europe excl. Russian Federation	763	0.40	585	0.30	330	0.16
Total Europe	**795**	**0.08**	**1 171**	**0.12**	**348**	**0.03**
Caribbean	85	1.34	69	0.97	39	0.51
Central America	-218	-0.81	-211	-0.85	-130	-0.56
North America	-160	-0.02	327	0.05	-57	-0.01
Total North and Central America	**-293**	**-0.04**	**184**	**0.02**	**-148**	**-0.02**
Total Oceania	**-165**	**-0.09**	**-231**	**-0.13**	**423**	**0.23**
Total South America	**-5 102**	**-0.54**	**-5 249**	**-0.58**	**-2 597**	**-0.30**
WORLD	**-7 838**	**-0.19**	**-5 173**	**-0.13**	**-4 739**	**-0.12**

Note: The rate of change (%) is calculated as the compound annual change rate.

in Brazil, where the annual rate of net forest loss increased from 3.78 million ha in 1990–2000 to 3.95 million ha in 2000–2010 before declining to 1.50 million ha in 2010–2020.

Paraguay and Peru both recorded increases in the annual rate of net forest loss between 1990 and 2020. In Paraguay, the rate increased from 255 000 ha per year in 1990–2000, to 342 000 ha in 2000–2010, to 347 000 ha in 2010–2020. In Peru, the rate of loss climbed from 115 000 ha per year in 1990–2000, to 125 000 ha in 2000–2010, to 172 000 ha in the most recent decade.

North and Central America had an average annual net loss of forest area of 293 000 ha in 1990–2000, a net annual gain of 184 000 ha in 2000–2010, and a net annual loss of 148 000 ha in 2010–2020. This fluctuation mainly reflects changes in data collection in the national forest inventory of the United States of America and, as explained in that country's report, it does not reflect real forest-area dynamics.

Asia had the highest net gain in forest area in 2010–2020, the majority of which was in East Asia, with China reporting a net annual increase of 1.94 million ha. Asia has recorded an overall net increase in forest area since 1990, with the area increasing by 202 000 ha per year in 1990–2000, 2.35 million ha per year in 2000–2010, and 1.17 million ha per year in 2010–2020. Subregionally, net forest losses were recorded between 1990 and 2020 in South and Southeast Asia due to significant declines in forest area in Cambodia, Indonesia and Myanmar, although these were partially offset subregionally by forest-area gains in India and Viet Nam. The rate of net forest loss decreased significantly in South and Southeast Asia over the period, from 1.84 million ha per year in

FIGURE 7. Forest area, by region, 1990–2020

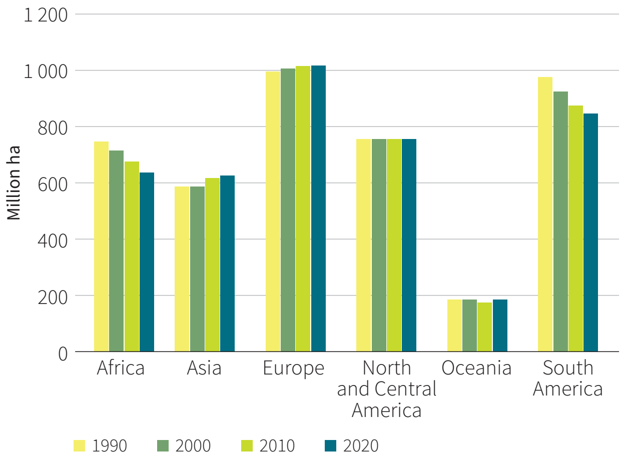


TABLE 7. Top ten countries for average annual net loss of forest area, 2010–2020

Ranking	Country	Annual net change	
		1 000 ha/yr	%
1	Brazil	-1 496	-0.30
2	Democratic Republic of the Congo	-1 101	-0.83
3	Indonesia	-753	-0.78
4	Angola	-555	-0.80
5	United Republic of Tanzania	-421	-0.88
6	Paraguay	-347	-1.93
7	Myanmar	-290	-0.96
8	Cambodia	-252	-2.68
9	Bolivia (Plurinational State of)	-225	-0.43
10	Mozambique	-223	-0.59

Note: The rate of change (%) is calculated as the compound annual change rate.

1990–2000 to 941 000 ha per year in 2010–2020. This decline was due mainly to a substantial reduction in forest loss in Indonesia, down from 1.73 million ha per year in 1990–2000 to 753 000 ha per year in 2010–2020.

Oceania recorded the second-largest average annual net gain in forest area (after Asia) in 2010–2020, at 423 000 ha, reversing the region's negative trend of previous decades. The reversal mainly reflects changes reported by Australia, from an average annual net loss of 207 000 ha in 1990–2000 and 227 000 ha in 2000–2010 to an average annual net gain of 446 000 ha in 2010–2020.

TABLE 8. Top ten countries for average annual net gain in forest area, 2010–2020

Ranking	Country	Annual net change	
		1 000 ha/yr	%
1	China	1 937	0.93
2	Australia	446	0.34
3	India	266	0.38
4	Chile	149	0.85
5	Viet Nam	126	0.90
6	Turkey	114	0.53
7	United States of America	108	0.03
8	France	83	0.50
9	Italy	54	0.58
10	Romania	41	0.62

Note: The rate of change (%) is calculated as the compound annual change rate.

There was a net gain in forest area in Europe in the three decades to 2020. The average annual net gain increased from 795 000 ha in 1990–2000 to 1.17 million ha in 2000–2010, before dropping to 348 000 ha in 2010–2020. The increase between 2000 and 2010 was due mainly to the Russian Federation, which reported average annual net gains of 31 900 ha in 1990–2000, 587 000 ha in 2000–2010 and 17 600 ha in 2010–2020.

Table 7 shows the top ten countries worldwide for average annual net losses of forest area between 2010 and 2020, and Table 8 shows the top ten countries for average annual net gains in forest area in the same period.

DEFORESTATION

Because information on forest area net change alone is insufficient to describe the complexity of land-use dynamics, countries were asked to provide estimates of forest expansion (afforestation and natural forest expansion) and deforestation for FRA 2020.

The collected data enabled the estimation of the deforestation rate at the regional and global levels over the reporting period.

An estimated 420 million ha of forest was lost through deforestation between 1990 and 2020, although the rate slowed over the period. Deforestation occurred at a rate of 15.8 million ha per year in 1990–2000, 15.1 million ha per year in 2000–2010, 11.8 million ha in 2010–2015 and 10.2 million ha per year in 2015–2020.

More than 90 percent of deforestation in 1990–2020 was in the tropical domain (Table 9), where the rate averaged 9.28 million ha per year in 2015–2020 (which, nevertheless, was significantly lower than the tropical average in 1990–2000 of 13.8 million ha per year). The

TABLE 9. Deforestation rate, by climatic domain, for four periods spanning 1990–2020

Climatic domain	Deforestation (million ha/yr)			
	1990–2000	2000–2010	2010–2015	2015–2020
Boreal	0.10	0.09	0.13	0.06
Temperate	0.49	0.54	0.53	0.31
Subtropical	1.44	1.35	0.88	0.50
Tropical	13.8	13.2	10.3	9.3
TOTAL	**15.8**	**15.1**	**11.8**	**10.2**

TABLE 10. Deforestation rate, by region and subregion, for four periods spanning 1990–2020

Region/subregion	Deforestation (1 000 ha/yr)			
	1990–2000	2000–2010	2010–2015	2015–2020
Eastern and Southern Africa	1 781	2 240	2 116	2 199
Northern Africa	461	442	330	316
Western and Central Africa	1 854	1 631	1 998	1 899
Total Africa	**4 096**	**4 314**	**4 444**	**4 414**
East Asia	399	353	369	170
South and Southeast Asia	3 689	2 232	2 460	1 958
Western and Central Asia	82	99	96	107
Total Asia	**4 170**	**2 684**	**2 925**	**2 235**
Total Europe	**88**	**92**	**201**	**69**
Caribbean	3	2	23	5
Central America	228	222	142	168
North America	740	475	253	263
Total North and Central America	**972**	**699**	**418**	**436**
Total Oceania	**655**	**662**	**458**	**42**
Total South America	**5 837**	**6 667**	**3 354**	**2 953**
WORLD	**15 818**	**15 117**	**11 801**	**10 150**

annual rate of deforestation decreased significantly in the subtropical domain between the two periods of 1990–2000 and 2015–2020, from 1.44 million ha to 0.50 million ha. The deforestation rate decreased slightly in the temperate domain between these two periods and was relatively low in the boreal domain.

The highest annual deforestation rate in 2015–2020 was in Africa (4.41 million ha), followed by South America (2.96 million ha) and Asia (2.24 million ha) (Table 10). In Africa, most of the deforestation was in Eastern and Southern Africa (2.20 million ha per year) and Western and Central Africa (1.90 million ha per year). In Asia, the deforestation occurred mostly in South and Southeast Asia (1.96 million ha per year).

The deforestation rate has increased in Africa since 1990, although there was a modest decrease in the rate in 2015–2020 compared with 2010–2015. On the other hand, the deforestation rates in Asia and South America are now almost half what they were in the 1990s.

The deforestation rate increased slightly in Oceania in 2000–2010 compared with 1990–2000 but has decreased since, including in 2015–2020.

Although coverage is good (i.e. by country) for data on deforestation, afforestation and natural forest expansion in FRA 2020, and their quality is higher than in the previous assessments, major gaps and deficiencies remain. Therefore, estimates in FRA 2020 of forest area change dynamics at the country level should be treated with caution.

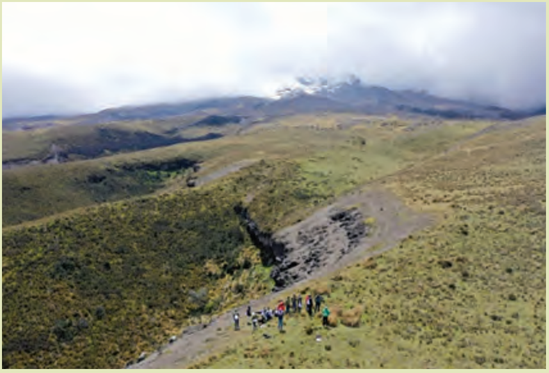
Box 4. Seeing the forest and the trees

Satellite remote sensing is an efficient way to monitor many environmental variables. Existing and forthcoming space-borne data streams, which can produce vast amounts of information at varying levels of detail, are also increasingly subject to "open data" policies, under which they are freely available to the global community.

Passive remote sensing measures the electromagnetic radiation reflected by or emitted from the Earth. Active remote sensing satellites use their own energy sources to illuminate the Earth and detect and measure the reflected radiation. In optimal conditions, both types of remote sensing can produce high-quality information at a low cost. For forest monitoring, however, a number of significant challenges need to be taken into account when producing and using remote sensing-based information products.

In the FAO Global Forest Resources Assessment, the United Nations Framework Convention on Climate Change and many other international processes and institutions, "forest" is primarily a definition of a **land use**. Therefore, an area of land can be forest even if it doesn't have trees on it. On the other hand, agricultural and urban areas with tree cover may be considered as land uses other than forest. This can be problematic for automated analyses of satellite remote sensing data because the sensors can only observe **land cover**.

Remote sensing instruments also have certain limitations in se parating forest from other vegetation types – such as the inability of medium-resolution optical sensors to measure vegetation height. In certain conditions, therefore, it is common for low and dense woody vegetation such as bushland and shrubland to be misclassified as tree cover (see photo this page). On the other hand, forests with sparse canopy cover or that lack leaves (e.g. during dormancy) may unintentionally be omitted from forest-area estimates.



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Cotopaxi, Ecuador (4 300 metres above sea level). According to the Global Forest Change product (Hansen *et al.*, 2013), this area has approximately 22 percent of tree cover, but a visit to the field revealed that it had no trees.

The use of remote sensing for assessing land-cover and land-use change is even more complex. In the context of forestry, land-cover change may be caused, for example, by certain forest management practices and natural disturbances. A change in land cover, however, does not necessarily mean a change in land use. The impact of a wildfire is a typical example of this: the fire may cause a significant (usually temporary) change in vegetation cover but does not necessarily result in a change in land use. Another example is clearcutting as part of forest management – the clearcut land will be without tree cover only temporarily because it will be reforested through planting, seeding or natural regeneration.

Another common challenge in the use of remote sensing for forest monitoring is the time factor in tree-cover loss and recovery. This challenge can be explained using an example: the clearcutting of a stand of trees in boreal forest would be immediately observable using remote sensing, but the regrowth of the stand would be apparent only after 10–20 years. Thus, the use of a short observation period may result in the misclassification of tree-cover change as land-use change (i.e. deforestation).

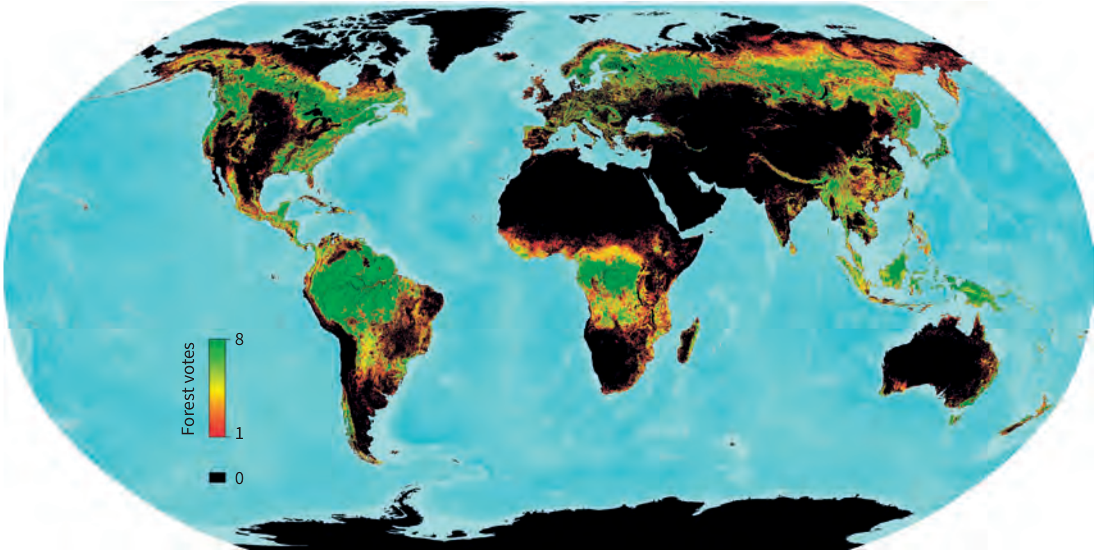
Finally, the quality of remote sensing-based mapping products varies significantly, depending on factors such as the characteristics of the target area; the sensor used; image resolution; the classification or estimation methodology used; data preprocessing; acquisition date; and the land-cover categories applied and their definitions. A comparison of eight globally available products showed that previous satellite-based estimates of global forest area varied from 3.2 billion ha to 4.1 billion ha (Sexton *et al.*, 2015), with the highest level of disagreement among products in sparsely forested areas (Figure 8). Therefore, caution is required when estimating forest change by comparing two independent mapping products (see Box 5, for example).

Remote sensing is a valuable tool for land-cover assessment and monitoring, but it should be used with care. There is a need to use consistent terminology, differentiate clearly between land cover and land use, and recognize that global remote sensing products may have significant limitations at the local scale. On their own, remote sensing-derived estimates of land

(Continued)

Box 4. *(Continued)*

Figure 8. Global distribution of consensus among eight satellite-based datasets



Note: A high value of votes means a high level of agreement among datasets, and vice versa. *Source:* Sexton *et al*. (2015).

cover and land-cover change are insufficient to support holistic policy formulation and decision-making – which also require data on, among other things, growing stock, biomass, carbon stock, biodiversity and forest health. Responding to these data needs requires a well-designed, multipurpose field inventory, which can also be used to derive reliable forest-area estimates with known confidence limits.

Other land with tree cover

STATUS

The category "other land with tree cover" comprises areas found in rural landscapes and urban settings that meet the thresholds for tree cover established by FAO's forest definition but for which the land use is not forest (and therefore the land does not meet FAO's forest definition). This category is reported here because of its importance in the provision of goods and ecosystem services. It has four subcategories: trees in urban settings; tree orchards; palms; and agroforestry.

Table 11 (p. 23) shows the estimated areas in each of these subcategories, by region and subregion. Not all countries reported areas in all subcategories. Overall, there is an estimated 11.8 million ha of palms in 94 countries and territories, mostly in Asia (8.18 million ha), Africa (1.66 million ha) and South America (1.01 million ha).

Seventy-six countries and territories reported a total area of tree orchards of 27.8 million ha, mostly in Asia (11.7 million ha), Europe (8.34 million ha), Africa (3.99 million ha) and North and Central America (3.41 million ha).

Seventy-one countries and territories reported an area of 45.4 million ha of agroforestry in 2020, mostly in Asia (31.2 million ha) and Africa (12.8 million ha). There is an estimated 1.28 million ha of agroforestry in North and Central America.

Trees in urban settings were reported by 52 countries and territories, with a total area of 20.3 million ha. Of this, more than two-thirds (13.8 million ha) is in North and Central America, with more modest areas in Europe (2.77 million ha) and Asia (2.40 million ha).

TRENDS

Figure 9 shows global change in the area of other land with tree cover from 1990 to 2020. The trend for palms is based on data reported by 83 countries and territories. The area

Box 5. Understanding regional differences between products in estimated forest area and tree cover

A comparison was made of estimates of forest area by the Global Forest Resources Assessment (FRA) and of tree cover derived from the Global Forest Change (GFC) product (University of Maryland), at the subregional level. Data for 2010 were used for the comparison because this was the most recent year for which the GFC tree-cover layer was available.[11]

The largest relative differences between the two sets of estimates were in Northern Africa and Western and Central Asia, where FRA forest-area estimates **were much higher** than those derived using the GFC. In these regions, the forest share of the total land area was typically low (less than 5 percent); these regions are characterized by open-forest formations such as open woodlands, savannas and the saxaul forests of Central Asia.

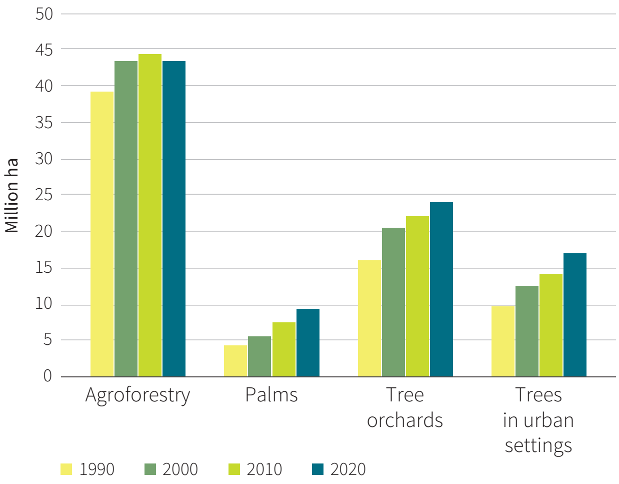
In Central America, Western and Central Africa, and South and Southeast Asia, FRA estimates of total forest area **were lower** than those derived from the GFC product. In these subregions, the share of the land area with forest cover is high (>30 percent), with large areas characterized by tropical rainforest, having high (>70 percent) crown cover, and also by landscapes consisting of 10–30 percent tree cover and 50 percent croplands (Mayaux *et al.*, 2013).

There are many reasons for these differences. The GFC used optical remote sensing; as described in Box 4, this technology has certain challenges in detecting open-forest formations, which are widespread in Northern Africa and Western and Central Asia. Moreover, separating forest from "other wooded land" is sometimes problematic in those regions, which may affect FRA estimates. This is likely to be especially true in Western and Central Asia, where 16 of 25 countries reported forest-area data based on secondary sources such as land registers and questionnaires.

In those areas where FRA estimates of forest area were much lower than those of the GFC, the likely explanation is that remote sensing-based estimates include large areas of agricultural land with canopy cover (e.g. oil palm and cacao), agroforestry, and other vegetation not meeting the FRA definition of forest. In such areas, the quality of data used for the FRA reports is high, with only 2 of 51 countries basing their estimates on the lowest-tier sources (see Box 11).

Overall, more work is required to determine the reasons for differences between the datasets and thereby to better understand the extent and dynamics of global forest resources. Cross-checking country-reported data with other data sources and understanding the reasons for differences will help improve both the remote sensing products and FRA reports and increase the overall transparency of forest resource information. To this end, the FRA process seeks to improve the capacity of countries to access and use remote sensing data and products. During the process to produce FRA 2020, FAO took initial steps towards integrating freely available geospatial data and products into the new FRA reporting platform, with support from Google. This work will continue in coming years with the aim of helping countries assess the value of remote sensing data and products and supporting them to integrate such products into national processes.

FIGURE 9. Global area of other land with tree cover, 1990–2020



of palms more than doubled between 1990 and 2020, from 4.20 million ha to 9.34 million ha. Most of the increase was in Asia (up from 3.14 million ha in 1990 to 7.61 million ha in 2020) and mainly in Malaysia (up from 2.35 million ha to 6.36 million ha).

Seventy-six countries and territories reported on trends in the area of tree orchards, which increased by 7.64 million ha between 1990 and 2020. Asia contributed a large part of this, with the area in that region growing from 5.71 million ha in 1990 to 11.7 million ha in 2020. Most of the increase was in China (up from 3.95 million ha to 10.2 million ha).

Fifty-four countries and territories reported trend data on agroforestry. The area of land subject to agroforestry increased by 4.21 million ha between 1990

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[11] The GFC data used in this analysis were generated using a 30 percent tree-cover threshold. The data were downloaded from www.globalforestwatch.org

TABLE 11. Area of other land with tree cover, by region and subregion, 2020

Region/subregion	Agroforestry		Palms		Tree orchards		Trees in urban settings	
	No. of reporting countries	Area (1 000 ha)	No. of reporting countries	Area (1 000 ha)	No. of reporting countries	Area (1 000 ha)	No. of reporting countries	Area (1 000 ha)
Eastern and Southern Africa	5	1 385	3	774	3	10	3	3
Northern Africa	3	159	4	368	3	3 688	4	944
Western and Central Africa	6	11 234	6	510	5	295	2	18
Total Africa	**14**	**12 778**	**13**	**1 652**	**11**	**3 993**	**9**	**965**
East Asia	2	0	3	317	4	10 558	3	321
South and Southeast Asia	6	30 695	8	7 639	8	891	4	253
Western and Central Asia	8	506	10	225	9	243	6	1 821
Total Asia	**16**	**31 201**	**21**	**8 181**	**21**	**11 692**	**13**	**2 395**
Total Europe	**20**	**75**	**36**	**10**	**28**	**8 338**	**15**	**2 767**
Caribbean	7	459	6	57	5	8	6	26
Central America	3	696	1	111	0	0	0	0
North America	4	129	4	99	5	3 399	2	13 751
Total North and Central America	**14**	**1 284**	**11**	**266**	**10**	**3 407**	**8**	**13 777**
Total Oceania	**2**	**1**	**7**	**645**	**4**	**20**	**2**	**216**
Total South America	**5**	**93**	**6**	**1 013**	**2**	**338**	**5**	**159**
WORLD	**71**	**45 432**	**94**	**11 767**	**76**	**27 788**	**52**	**20 279**

and 2020, from 39.1 million ha to 43.3 million ha. Most of the increase was in Asia (up by 2.47 million ha) and Africa (up by 1.62 million ha).

The area of land occupied by trees in urban settings, as reported by 36 countries and territories, increased by 7.45 million ha between 1990 and 2020, from 9.66 million ha to 17.1 million ha. There were increases in all regions, with the largest in North and Central America (up from 7.66 million ha in 1990 to 13.8 million ha in 2020), mostly in the United States of America.

Other wooded land

STATUS

FRA 2020 received information on the area of "other wooded land" in 2020 from all countries and territories except Australia (where it is included in "other land area"). The area of other wooded land worldwide is estimated at 977 million ha, which is 7 percent of the total land area (Table 12). Africa has the largest area of other wooded land (446 million ha), followed by Asia (191 million ha), South America (147 million ha), Europe (100 million ha), North and Central America (90.5 million ha) and Oceania (2.47 million ha).

Table 13 shows the top ten countries for other wooded land, four of which (Brazil, Canada, China and the Russian Federation) are also in the top ten for forest area.

TABLE 12. Area of other wooded land, by region and subregion, 2020

Region/subregion	Other wooded land (1 000 ha)
Eastern and Southern Africa	284 447
Northern Africa	59 122
Western and Central Africa	101 941
Total Africa	**445 509**
East Asia	114 620
South and Southeast Asia	56 741
Western and Central Asia	19 614
Total Asia	**190 976**
Total Europe	**100 499**
Caribbean	2 113
Central America	4 616
North America	83 786
Total North and Central America	**90 515**
Total Oceania	**2 474**
Total South America	**146 645**
WORLD	**976 619**

TABLE 13. Top ten countries for area of other wooded land, 2020

Ranking	Country	Other wooded land	
		Area (1 000 ha)	% of land area
1	China	109 545	12
2	Russian Federation	74 885	5
3	Argentina	62 964	23
4	Namibia	54 081	66
5	South Africa	49 682	41
6	Canada	40 866	4
7	Brazil	38 713	5
8	South Sudan	32 582	52
9	Kenya	32 271	57
10	Botswana	26 491	47

TRENDS

Worldwide, the area of other wooded land decreased by 30.6 million ha between 1990 and 2020, although the big declines in 1990–2000 and 2000–2010 were offset somewhat by a small gain in 2010–2020 (Table 14). Both Asia and North and Central America reported significant increases in the most recent decade, but this finding should be treated with caution for the latter region because, to a large extent, the increase in North and Central America is explained by the inclusion of arid wooded land in the western United States of America, which previously was not counted.

In South America, the rate of decrease in the area of other wooded land slowed significantly in the most recent decade, due mainly to an increase in the area of other wooded land reported by Chile. Similar to the trend in North and Central America, that increase can mainly be attributed to a greater level of detail in mapping rather than to an actual increase.

Large declines in the area of other wooded land were recorded in all African subregions, driven mainly by losses in Angola, Chad, Madagascar, Sudan and the United Republic of Tanzania; combined, these countries accounted for more than 80 percent of the loss.

Many countries face challenges in monitoring the area of other wooded land, largely associated with difficulties in measuring tree-canopy cover in the range of 5–10 percent; thus, many countries lack reliable data on this parameter.

TABLE 14. Area of other wooded land and annual change, by region and subregion, 1990–2020

Region/subregion	Other wooded land (1 000 ha)				Annual change (1 000 ha/yr)		
	1990	2000	2010	2020	1990–2000	2000–2010	2010–2020
Eastern and Southern Africa	308 141	299 683	291 438	284 447	-846	-825	-699
Northern Africa	65 164	63 322	61 184	59 122	-184	-214	-206
Western and Central Africa	113 135	111 139	107 356	101 941	-200	-378	-542
Total Africa	**486 441**	**474 145**	**459 978**	**445 509**	**-1 230**	**-1 417**	**-1 447**
East Asia	106 006	104 593	110 044	114 620	-141	545	458
South and Southeast Asia	53 850	54 065	54 043	56 741	21	-2	270
Western and Central Asia	16 088	17 153	18 872	19 614	107	172	74
Total Asia	**175 944**	**175 810**	**182 960**	**190 976**	**-13**	**715**	**802**
Total Europe	**103 775**	**98 579**	**100 946**	**100 499**	**-520**	**237**	**-45**
Caribbean	2 114	2 259	2 152	2 113	15	-11	-4
Central America	3 634	3 962	4 266	4 616	33	30	35
North America	76 836	76 976	76 824	83 786	14	-15	696
Total North and Central America	**82 584**	**83 197**	**83 242**	**90 515**	**61**	**5**	**727**
Total Oceania	**2 633**	**2 525**	**2 509**	**2 474**	**-11**	**-2**	**-3**
Total South America	**155 846**	**151 496**	**146 931**	**146 645**	**-435**	**-456**	**-29**
WORLD	**1 007 222**	**985 752**	**976 566**	**976 619**	**-2 147**	**-919**	**5**

3

Forest characteristics

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Forests encompass a wide range of ecosystems that vary considerably in their characteristics, such as in species composition, structure and the extent of modification by humans and by non-human factors. Thus, forest area is an insufficient parameter, on its own, for identifying important trends and assessing progress towards sustainable forest management.

FRA identifies two broad categories of forest: naturally regenerating forest, and planted forest. FRA 2020 collected information on both these categories, as well as on certain subcategories discussed below.

There is ongoing debate on the functions and values of naturally regenerating versus planted forests. Naturally regenerating forests (also called natural forests) generally contribute more to biodiversity conservation and provide a wider range of benefits and certain ecosystem services compared with planted forests. When sustainably managed, planted forests can help reduce harvesting pressure on natural forests, and some may also provide important ecosystem services.

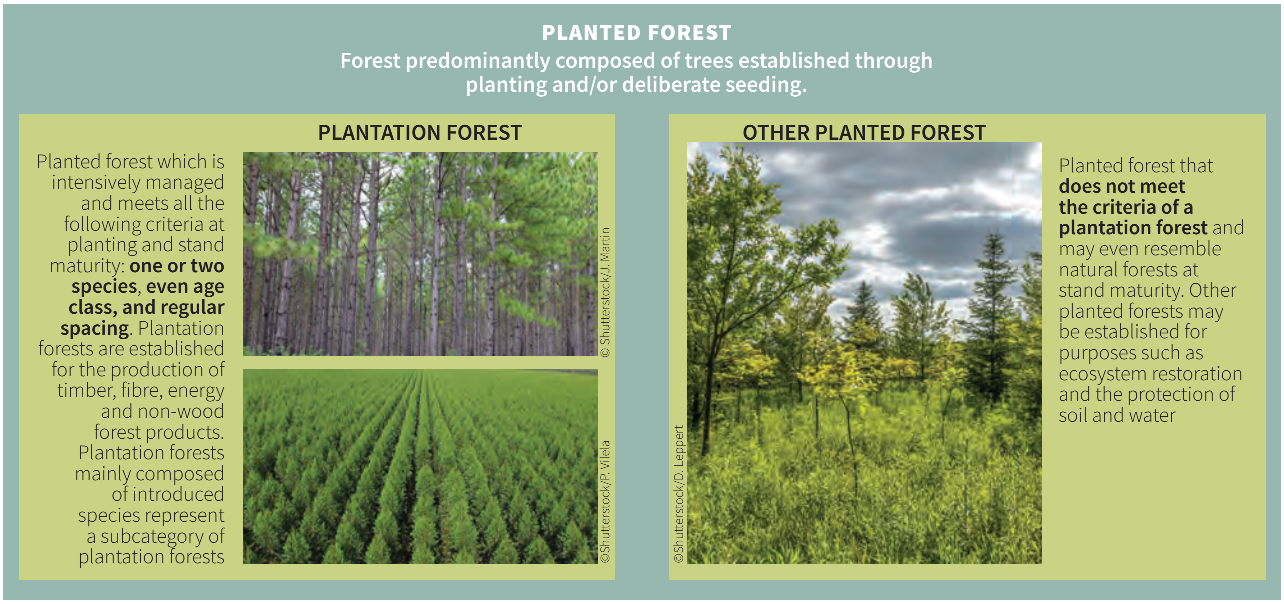
Information was collected on two subcategories of planted forest: "plantation" and "other planted" (Figure 10). Countries also estimated the proportion of their plantation forests mainly composed of introduced species. In addition to the main categories of natural and planted forest, information was collected on primary forests; mangroves; bamboo forests; and rubberwood plantations.

Naturally regenerating forest

STATUS

FRA 2020 received information on the area of naturally regenerating forest in 2020 from 219 countries and

FIGURE 10. Components of planted forest



PLANTED FOREST
Forest predominantly composed of trees established through planting and/or deliberate seeding.

PLANTATION FOREST

Planted forest which is intensively managed and meets all the following criteria at planting and stand maturity: **one or two species**, **even age class, and regular spacing**. Plantation forests are established for the production of timber, fibre, energy and non-wood forest products. Plantation forests mainly composed of introduced species represent a subcategory of plantation forests

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OTHER PLANTED FOREST

Planted forest that **does not meet the criteria of a plantation forest** and may even resemble natural forests at stand maturity. Other planted forests may be established for purposes such as ecosystem restoration and the protection of soil and water

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territories representing nearly 100 percent of the world's forest area. Naturally regenerating forests account for 93 percent (3.75 billion ha) of the total forest area. Of the regions, Europe has the largest area in this forest category, followed by South America, North and Central America, Africa, Asia and Oceania (Table 15). Naturally regenerating forests constitute 100 percent of the forest resource in 34 countries.

TABLE 15. Area of naturally regenerating forest, by region and subregion, 2020

Region/subregion	Area (1 000 ha)	% of forest area
Eastern and Southern Africa	288 639	98
Northern Africa	33 168	94
Western and Central Africa	303 441	99
Total Africa	**625 248**	**98**
East Asia	173 264	64
South and Southeast Asia	264 578	89
Western and Central Asia	49 288	90
Total Asia	**487 130**	**78**
Europe excl. Russian Federation	132 372	70
Total Europe	**928 803**	**93**
Caribbean	7 008	89
Central America	22 014	98
North America	676 632	94
Total North and Central America	**705 654**	**94**
Total Oceania	**179 949**	**97**
Total South America	**823 941**	**98**
WORLD	**3 750 724**	**93**

TRENDS

FRA 2020 received information on trends in naturally regenerating forests from 216 countries and territories representing 99 percent of the world's forest area. According to these data, the area of naturally regenerating forests decreased by 301 million ha between 1990 and 2020 (Table 16). The overall rate of loss slowed in each ten-year period, from 11.9 million ha per year in 1990–2000, to 10.3 million ha in 2000–2010, to 7.84 million ha in the most recent decade (Table 17).

The area of naturally regenerating forests decreased in all regions except Europe and Oceania between 2010 and 2020, with the biggest loss occurring in sub-Saharan Africa. Overall in Africa, naturally regenerating forest was lost at an average of 3.32 million ha per year in 1990–2000, 3.57 million ha per year in 2000–2010, and 4.01 million ha

TABLE 16. Area of naturally regenerating forest, by region and subregion, 1990–2020

Region/subregion	Naturally regenerating forest (1 000 ha)			
	1990	2000	2010	2020
Eastern and Southern Africa	339 874	326 366	308 090	288 639
Northern Africa	38 542	36 627	34 984	33 168
Western and Central Africa	355 885	338 136	322 316	303 441
Total Africa	**734 301**	**701 128**	**665 390**	**625 248**
East Asia	152 423	160 773	165 507	173 264
South and Southeast Asia	313 562	286 574	277 679	264 578
Western and Central Asia	44 965	45 738	47 806	49 288
Total Asia	**510 950**	**493 085**	**490 992**	**487 130**
Europe excl. Russian Federation	116 352	118 921	118 854	118 819
Total Europe	**912 651**	**912 829**	**914 376**	**915 250**
Caribbean	5 451	6 277	6 735	7 008
Central America	27 928	25 687	23 438	22 014
North America	698 721	687 735	683 341	676 632
Total North and Central America	**732 099**	**719 699**	**713 514**	**705 654**
Total Oceania	**181 705**	**179 067**	**176 037**	**179 949**
Total South America	**966 621**	**913 239**	**855 289**	**823 941**
WORLD	**4 038 327**	**3 919 046**	**3 815 598**	**3 737 172**

per year in 2010–2020. The increase in the rate of loss in the most recent decade was due mainly to Eastern and Southern Africa, where the rate rose from 1.83 million ha per year in 2000–2010 to 1.96 million ha per year in 2010–2020. Losses in that subregion in 2010–2020 were led by Angola, at 548 000 ha per year.

The rate of loss of naturally regenerating forests declined by almost half (46 percent) in South America in the most recent decade, from 5.80 million ha in 2000–2010 to 3.14 million ha in 2010–2020. This was due mainly to a reduction in Brazil, where the average annual loss declined from 4.32 million ha in 2000–2010 to 1.89 million ha in 2010–2020.

North and Central America reported a net annual loss of naturally regenerating forest of 786 000 ha in 2010–2020, due mainly to North America, with the Caribbean showing a slight increase in area. The region's average annual rate of loss was considerably lower than in 1990–2000, largely because of a decline in the annual loss in North America. This, in turn, was due mainly to the United States of America, where the average annual loss declined from 354 000 ha in 1990–2000 to 88 200 ha in 2010–2020.

Asia had an overall loss of naturally regenerating forest of 386 000 ha per year in 2010–2020, due mainly to losses in South and Southeast Asia; there were gains in area over the period in East Asia and Western and Central Asia. The average annual rate of loss in Asia was higher in 2010–2020 than in 2000–2010; nevertheless, it was still much (80 percent) lower than in 1990–2000, when it was 1.79 million ha. The declining rate was due mainly to a reduction in losses in South and Southeast Asia, especially Indonesia, which lost naturally regenerating forest at a rate of 2.10 million ha per year in 1990–2000 and a much lower 787 000 ha per year in 2010–2020.

The area of naturally regenerating forests increased in both Europe and Oceania in the most recent decade. In Oceania, the gain of 391 000 ha per year represented a reversal compared with previous decades – when forest area was lost at the rate of 264 000 ha per year in 1990–2000 and 303 000 ha in 2000–2010. This mainly reflects changes in Australia, which reported losses of

TABLE 17. Annual change in the area of naturally regenerating forest, by region and subregion, 1990–2020

Region/subregion	Average annual change					
	1990–2000		2000–2010		2010–2020	
	Area (1 000 ha/yr)	Rate (%)	Area (1 000 ha/yr)	Rate (%)	Area (1 000 ha/yr)	Rate (%)
Eastern and Southern Africa	-1 351	-0.40	-1 828	-0.57	-1 945	-0.65
Northern Africa	-192	-0.51	-164	-0.46	-182	-0.53
Western and Central Africa	-1 775	-0.51	-1 582	-0.48	-1 887	-0.60
Total Africa	**-3 317**	**-0.46**	**-3 574**	**-0.52**	**-4 014**	**-0.62**
East Asia	835	0.53	473	0.29	776	0.46
South and Southeast Asia	-2 699	-0.90	-889	-0.31	-1 310	-0.48
Western and Central Asia	77	0.17	207	0.44	148	0.31
Total Asia	**-1 787**	**-0.36**	**-209**	**-0.04**	**-386**	**-0.08**
Russian Federation	-239	-0.03	161	0.02	91	0.01
Europe excl. Russian Federation	257	0.22	-7	-0.01	-3	0.00
Total Europe	**18**	**0.00**	**155**	**0.02**	**87**	**0.01**
Caribbean	83	1.42	46	0.71	27	0.40
Central America	-224	-0.83	-225	-0.91	-142	-0.62
North America	-1 099	-0.16	-439	-0.06	-671	-0.10
Total North and Central America	**-1 240**	-0.17	-618	-0.09	**-786**	**-0.11**
Total Oceania	**-264**	**-0.15**	**-303**	**-0.17**	**391**	**0.22**
Total South America	**-5 338**	**-0.57**	**-5 795**	**-0.65**	**-3 135**	**-0.37**
WORLD	**-11 928**	**-0.30**	**-10 345**	**-0.27**	**-7 843**	**-0.21**

Note: The rate of change (%) is calculated as the compound annual change rate.

TABLE 18. **Area of planted forest, and planted forest as a proportion of total forest area, by region and subregion, 2020**

Region/subregion	Planted forest (1 000 ha)	Planted forest as a proportion of total forest area (%)
Eastern and Southern Africa	7 139	2
Northern Africa	1 983	6
Western and Central Africa	2 269	1
Total Africa	**11 390**	**2**
East Asia	98 139	36
South and Southeast Asia	31 469	11
Western and Central Asia	5 621	10
Total Asia	**135 230**	**22**
Europe excl. Russian Federation	56 312	30
Total Europe	**75 193**	**7**
Caribbean	851	11
Central America	391	2
North America	45 785	6
Total North and Central America	**47 027**	**6**
Total Oceania	**4 812**	**3**
Total South America	**20 245**	**2**
WORLD	**293 895**	**7**

253 000 ha per year in the 1990s and gains of 424 000 ha per year in 2010–2020.[12]

In Europe, the area of naturally regenerating forest has increased in each of the last three decades, although the rate of gain slowed by almost half in 2010–2020 compared with 2000–2010, from 155 000 ha per year to 87 400 ha per year. This was due mainly to the Russian Federation, where the average annual increase in area declined from 161 000 ha in 2000–2010 to 90 900 ha in 2010–2020. If the Russian Federation is excluded, Europe experienced small decreases in the area of naturally regenerated forest in 2000–2010 (6 690 ha per year) and 2010–2020 (3 490 ha per year).

TABLE 19. **Top ten countries and territories for planted forest as a proportion of total forest area, 2020**

Ranking	Country	Planted forest as a proportion of total forest area (%)
1	Bahrain	100
2	Egypt	100
3	Faroe Islands	100
4	Greenland	100
5	Kuwait	100
6	Libya	100
7	Czechia	95
8	Netherlands	90
9	United Kingdom of Great Britain and Northern Ireland	89
10	Ireland	86

Planted forest

STATUS

FRA 2020 received information on the area of planted forests (including in the subcategories “plantation forest” and “other planted forest”) in 2020 from 219 countries and territories. The total area of planted forests globally is estimated at 294 million ha, which is 7 percent of the world forest area.

Among the regions, Asia has the largest area of planted forest, at 135 million ha (Table 18). The largest share of total forest area held by planted forests is also in Asia (22 percent); the proportion is 7 percent in Europe (the second-highest after Asia), although this increases to 30 percent if the Russian Federation is excluded. The lowest share of planted forest is in Africa and South America (each with 2 percent).

Six countries and territories – Bahrain, Egypt, the Faroe Islands, Greenland, Kuwait and Libya – reported that 100 percent of their forest area is composed of planted forests (Table 19). Forty-two countries and territories, of which eight have no forest, reported no areas of planted forest.

TRENDS

FRA 2020 received information on trends in planted forests from 216 countries and territories representing 99 percent of the world’s forest area. Globally, the area of planted forests increased by 123 million ha between 1990 and 2020 (Table 20). The average annual rate of increase was higher in 2000–2010, at 5.13 million ha, than in 1990–2000, at 4.06 million ha, but it dropped to 3.06 million ha in 2010–2020 (Table 21).

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[12] Time-series data in Australia’s country report to FRA 2020 show a decrease in forest area between 1990 and 2008, followed by a progressive increase to 2016, with a net increase of 3.9 million ha between 2011 and 2016. This reflects real on-the-ground changes in forest area derived from a consistent time series of Landsat satellite data and the uniform application across the time series of a current-area algorithm, as interpreted for Australia’s National Greenhouse Gas Inventory. The change in forest area is due to the net effect of forest clearing or re-clearing for agricultural use; the regrowth of forest on areas previously cleared for agricultural use; the expansion of forest into areas not recently containing forest; the establishment of environmental plantings; and changes in the commercial plantation estate.

TABLE 20. Area of planted forest, by region and subregion, 1990–2020

Region/subregion	Area of planted forest (1 000 ha)			
	1990	2000	2010	2020
Eastern and Southern Africa	6 161	6 214	6 758	7 139
Northern Africa	1 383	1 477	1 849	1 983
Western and Central Africa	956	1 230	2 017	2 269
Total Africa	**8 500**	**8 921**	**10 624**	**11 390**
East Asia	57 483	68 298	86 882	98 139
South and Southeast Asia	12 949	21 503	27 781	31 469
Western and Central Asia	3 757	4 206	4 976	5 621
Total Asia	**74 188**	**94 007**	**119 640**	**135 230**
Europe excl. Russian Federation	41 743	46 572	52 080	55 004
Total Europe	**54 394**	**61 932**	**71 693**	**73 884**
Caribbean	479	501	731	851
Central America	74	133	267	391
North America	22 596	31 986	39 646	45 785
Total North and Central America	**23 149**	**32 621**	**40 645**	**47 027**
Total Oceania	**2 784**	**3 775**	**4 491**	**4 812**
Total South America	**7 046**	**9 406**	**14 866**	**20 245**
WORLD	**170 061**	**210 662**	**261 958**	**292 587**

TABLE 21. Annual change in the area of planted forest, by region and subregion, 1990–2020

Region/subregion	Planted forest annual change					
	1990–2000		2000–2010		2010–2020	
	1 000 ha/yr	%	1 000 ha/yr	%	1 000 ha/yr	%
Eastern and Southern Africa	5	0.09	54	0.84	38	0.55
Northern Africa	9	0.66	37	2.27	13	0.70
Western and Central Africa	27	2.54	79	5.07	25	1.18
Total Africa	**42**	**0.48**	**170**	**1.76**	**77**	**0.70**
East Asia	1 082	1.74	1 858	2.44	1 126	1.23
South and Southeast Asia	855	5.20	628	2.59	369	1.25
Western and Central Asia	45	1.14	77	1.70	65	1.23
Total Asia	**1 982**	**2.40**	**2 563**	**2.44**	**1 559**	**1.23**
Europe excl. Russian Federation	483	1.10	551	1.12	292	0.55
Total Europe	**754**	**1.31**	**976**	**1.47**	**219**	**0.30**
Caribbean	2	0.45	23	3.84	12	1.54
Central America	6	6.07	13	7.21	12	3.86
North America	939	3.54	766	2.17	614	1.45
Total North and Central America	**947**	**3.49**	**802**	**2.22**	**638**	**1.47**
Total Oceania	**99**	**3.09**	**72**	**1.75**	**32**	**0.69**
Total South America	**236**	**2.93**	**546**	**4.68**	**538**	**3.14**
WORLD	**4 060**	**2.16**	**5 130**	**2.20**	**3 063**	**1.11**

Note: The rate of change (%) is calculated as the compound annual change rate.

The area of planted forest increased in all regions between 1990 and 2020, including in the most recent decade, at varying rates of annual gain. Most of the increases in 2010–2020 were in Asia, even though the average annual rate of gain was substantially less in that region than in previous decades. This trend mainly reflected a decrease in the rate of gain in East Asia, especially China, which reported an annual increase in planted forest of 1.07 million ha in 1990–2000, 1.85 million ha in 2000–2010 and 1.14 million ha in 2010–2020. There was also a reduction in the rate of gain in South and Southeast Asia; the average annual increase in planted forest area in India, for example, was 365 000 ha in 1990–2000, 341 000 ha in 2000–2010, and only 49 100 ha 2010–2020.

North and Central America had the second-largest increase in planted forest area in 2010–2020, but the average annual rate of gain has been slowing – from 947 000 ha in 1990–2000, to 802 000 ha in 2000–2010, to 638 000 ha in the most recent decade. This reduction in the rate of gain mainly reflects the situation in the United States of America, where the average annual increase in planted forest area more than halved from 462 000 ha in 1990–2000 to 196 000 ha in 2010–2020.

TABLE 22. Area of plantation forest and other planted forest, by region and subregion, 2020

Region/subregion	Area (1 000 ha)		
	Plantation forest	Other planted forest	Total planted forest
Eastern and Southern Africa	4 968	2 171	7 139
Northern Africa	1 241	741	1 983
Western and Central Africa	1 469	800	2 269
Total Africa	**7 678**	**3 712**	**11 390**
East Asia	48 994	49 144	98 139
South and Southeast Asia	26 631	4 839	31 469
Western and Central Asia	3 707	1 914	5 621
Total Asia	**79 332**	**55 897**	**135 230**
Europe excl. Russian Federation	4 495	51 817	56 312
Total Europe	**4 495**	**70 697**	**75 193**
Caribbean	716	135	851
Central America	356	35	391
North America	14 105	31 680	45 785
Total North and Central America	**15 177**	**31 850**	**47 027**
Total Oceania	**4 356**	**456**	**4 812**
Total South America	**20 099**	**145**	**20 245**
WORLD	**131 137**	**162 758**	**293 895**

The average annual rate of increase in planted forest area slowed slightly in South America, from 546 000 ha in 2000–2010 to 538 000 ha in 2010–2020. The biggest influence on the growth of planted forest area in the region in the last two decades has been Brazil, where the average annual increase was 9 410 ha in 1990–2000, 368 000 ha in 2000–2010 and 390 000 ha in 2010–2020. On the other hand, the rate of increase slowed in the most recent decade in Chile, Colombia, Peru and Uruguay.

The average annual rate of gain in planted forest area was substantially lower in Europe in 2010–2020 than in the previous two decades. This was due mainly to the Russian Federation, which had an average annual gain of 271 000 ha in 1990–2000 and 425 000 ha in 2000–2010 but an average annual loss of 73 300 ha in 2010–2020.

The area of planted forests in Africa increased by an annual average of 76 600 ha in 2010–2020, down from 170 000 ha in 2000–2010. The rate was 42 100 ha in 1990–2000.

The average annual rate of increase in the area of planted forests has trended downward in Oceania in the last three decades, from 99 100 ha in 1990–2000, to 71 600 ha in 2000–2010, to 32 100 ha in 2010–2020. This mainly reflects the situation in New Zealand, where the average annual increase in planted forest area declined from 49 400 ha in 1990–2000 to 6 020 ha in 2010–2020. The average annual increase in planted forest area grew in Australia, from 46 200 ha in 1990–2000 to 68 300 ha in 2000–2010, before dropping to 22 200 ha in 2010–2020.

Plantation forest and other planted forest

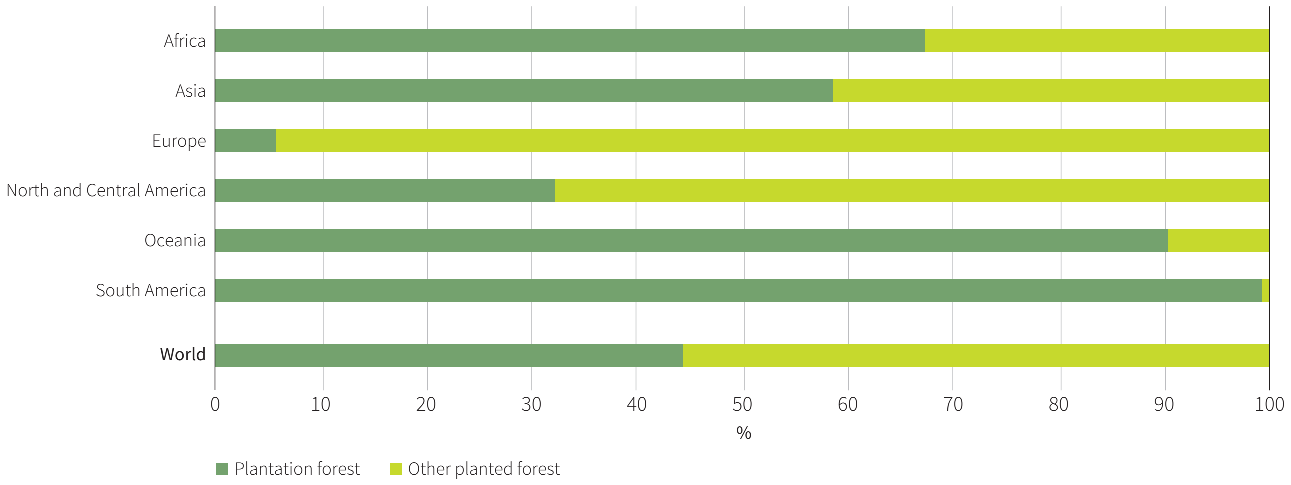
STATUS

This analysis of the status of plantation forests and other planted forests in 2020 is based on data reported by 219 countries and territories representing nearly 100 percent of the global forest area.

Worldwide, there are 131 million ha of plantation forests, which is 45 percent of the total planted forest area. The remainder (55 percent) is categorized as other planted forest, covering 163 million ha. The highest share of plantation forests is in South America, where this subcategory constitutes about 99 percent of the total area of planted forests. Plantation forests also account for most (91 percent) of the total planted forest area in Oceania, about two-thirds (67 percent) in Africa, and more than half (59 percent) in Asia (Table 22; Figure 11). Plantation forests comprise 100 percent of the planted forest area in six countries and territories (Table 23).

Other planted forests predominate in Europe, accounting for 94 percent of the total planted forest area,

FIGURE 11. Proportion of plantation forest and other planted forest, by region, 2020



and in North and Central America, at 68 percent of the total.

TRENDS

The area of plantation forests worldwide increased by 55.8 million ha between 1990 and 2020, with the biggest jump (21.2 million ha) occurring between 2000 and 2010. The average annual rate of gain increased from 1.98 million ha in 1990–2000 to 2.12 million ha in 2000–2010 before falling back to 1.48 million ha per year in the most recent decade.

The area of other planted forest increased by 66.8 million ha between 1990 and 2020. The average annual rate of gain increased from 2.08 million ha in 1990–2000 to 3.01 million ha in 2000–2010 before dropping to 1.59 million ha in 2010–2020.

The area of plantation forest has increased substantially in Asia in the last three decades, albeit with a declining average annual rate of increase, from 1.26 million ha in 1990–2000, to 975 000 ha in 2000–2010, to 735 000 ha in 2010–2020. The average annual rate of gain in other planted forest in the region more than doubled from 717 000 ha in 1990–2000 to 1.59 million ha in 2000–2010, before falling back to 824 000 ha in 2010–2020. The big increase in 2000–2010 was due largely to the implementation of large-scale afforestation programmes in China. The proportion of the planted forest area held by plantation forests declined in Asia between 1990 and 2020 (Figure 12).

The area of plantation forest in North and Central America increased at an average annual rate of 164 000 ha in the most recent decade, down from 270 000 ha in 1990–2000 and 420 000 ha in 2000–2010. The area of plantation forest in Europe decreased by an average annual rate of 17 700 ha in 2010–2020, reversing the previous increasing trend of 94 200 ha in 1990–2000 and 38 200 ha in 2000–2010. The shift from gain to loss was due mainly to Sweden, which experienced an average annual loss of 30 100 ha in 2010–2020.

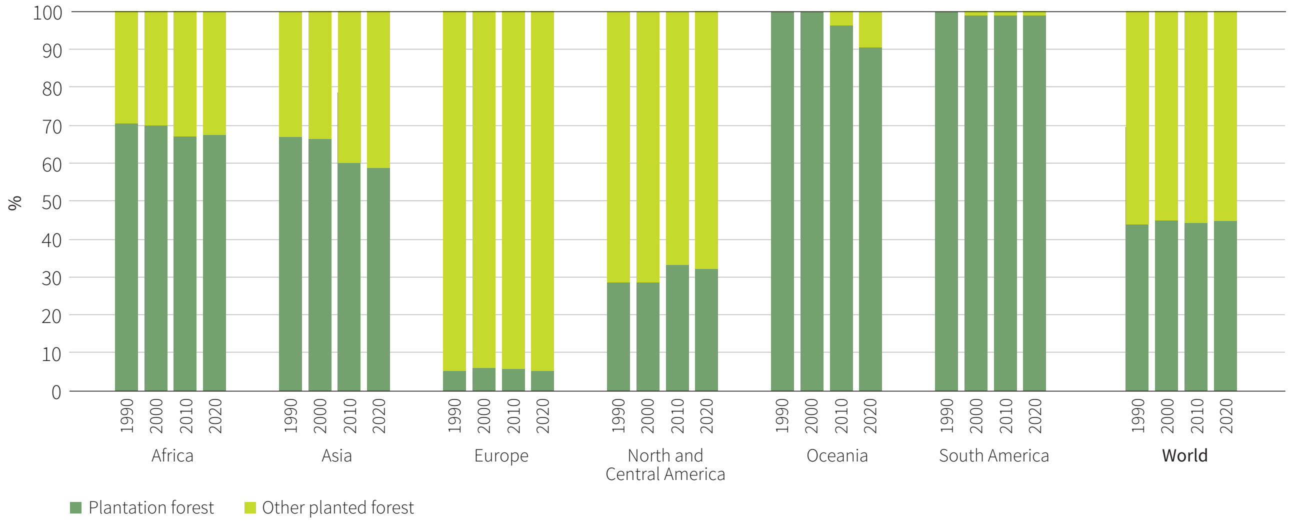
TABLE 23. Top ten countries and territories for plantation forest as a proportion of total forest area, 2020

Ranking	Country	Proportion of plantation forest (%)
1	Bahrain	100
2	Faroe Islands	100
3	Greenland	100
4	Kuwait	100
5	Libya	100
6	Ireland	86
7	Cabo Verde	70
8	Belgium	64
9	Uruguay	58
10	Rwanda	54

The average annual rate of increase in the area of plantation forest was lower in Africa in 2010–2020, at 55 300 ha, than in 2000–2010, at 89 800 ha (the rate of increase in 1990–2000 was 25 300 ha). The proportion of the planted forest area held by plantation forest in Africa was 70 percent in 1990, declining slightly to 67 percent in 2020.

Plantation forests accounted for 99.9 percent of the planted forest area in South America in 1990 and for about 99 percent in 2020; in Oceania, they comprised 99.7 percent in 1990 and 90.5 percent in 2020.

FIGURE 12. Plantation forest and other planted forest as a proportion of total planted forest area, by region, 1990–2020



Plantations of introduced species

STATUS

Of the 219 countries and territories that reported on the area of planted forests in 2020, 173 – representing 85 percent of the world's forest area – reported on the area of plantation forest composed of introduced species. Of those, almost half (86) reported that they have no introduced species and that all their plantation forests are composed of native species.

Globally, the area of plantation forest composed of introduced species is 49.7 million ha, which is 1.4 percent of the total forest area of the reporting countries. Introduced species account for 44 percent of the total area of plantation forest in the reporting countries (Table 24).

The largest area of plantation forest composed of introduced species is in Asia, at 20.9 million ha (32 percent of the total area of plantation forest in that region), followed by South America, at 17.8 million ha. The region with the highest proportion of plantation forest composed of introduced species is South America, at 97 percent, followed by Europe and Oceania (both 78 percent), Africa (70 percent) and North and Central America (4 percent). Thirty-nine countries reported that 100 percent of their plantation forest area is composed of introduced species.

TRENDS

Information on trends in the area of plantation forest composed of introduced species was available for 170 countries representing 85 percent of the world's forest area.

The area of plantation forest worldwide composed of introduced species increased by 26.7 million ha between 1990 and 2020, and the proportion of the total plantation forest area comprising introduced species increased from 34 percent in 1990 to 44 percent in 2020 (Table 25). This proportion almost doubled over the period in Asia, from 17 percent to 32 percent; it declined, however, in all other regions. Most of the increase in Asia was in East Asia; in China, for example, the area of plantation forest consisting of introduced species grew from 4.39 million ha in 1990 to 14.2 million ha in 2020.

Primary forest

Primary forests are naturally regenerated forests of native tree species, where there are no clearly visible indications of human activities and ecological processes are not significantly disturbed. Primary forests – especially primary tropical moist forests – are highly species-rich, diverse ecosystems, and their extent is an important environmental indicator.

STATUS

FRA 2020 received information on the area of primary forest in 2020 from 146 countries and territories representing 81 percent of the world's forest area. Despite the relatively high percentage of reporting on this variable, the reliability of the data is a cause for concern, with many countries and territories relying for their estimates on proxies such as the area of forest in national parks and other conservation areas.

Based on the provided data, the area of primary forests worldwide is estimated at 1.11 billion ha, or about one-third (34 percent) of the forest area of reporting

TABLE 24. Plantation forests composed of introduced species, by region and subregion, 2020

Region/subregion	Data availability		Plantation forest		
	No. of reporting countries	% of total forest area	Total area (1 000 ha)	… of which composed of introduced species	% introduced
Eastern and Southern Africa	20	95	4 089	3 019	74
Northern Africa	7	47	894	444	50
Western and Central Africa	17	78	716	528	74
Total Africa	**44**	**84**	**5 699**	**3 992**	**70**
East Asia	4	98	48 007	14 779	31
South and Southeast Asia	9	45	15 107	6 043	40
Western and Central Asia	20	79	2 448	116	5
Total Asia	**33**	**71**	**65 562**	**20 938**	**32**
Total Europe	**39**	**97**	**3 978**	**3 116**	**78**
Caribbean	22	95	684	221	32
Central America	4	62	201	36	18
North America	4	91	14 029	268	2
Total North and Central America	**30**	**90**	**14 915**	**525**	**4**
Total Oceania	**18**	**100**	**4 337**	**3 392**	**78**
Total South America	**9**	**75**	**18 278**	**17 767**	**97**
WORLD	**173**	**85**	**112 769**	**49 731**	**44**

TABLE 25. Plantation forests composed of introduced species as a proportion of total plantation forest area, by region and subregion, 1990–2020

Region/subregion	Data availability		Proportion of plantation forests composed of species (%)			
	No. of reporting countries	% of total forest area	1990	2000	2010	2020
Eastern and Southern Africa	20	95	72	72	73	74
Northern Africa	7	47	79	73	57	50
Western and Central Africa	17	78	91	89	77	74
Total Africa	**44**	**84**	**74**	**73**	**71**	**70**
East Asia	4	98	13	19	24	31
South and Southeast Asia	9	45	45	35	37	40
Western and Central Asia	20	79	4	4	4	5
Total Asia	**33**	**71**	**17**	**21**	**27**	**32**
Total Europe	**36**	**96**	**84**	**71**	**72**	**77**
Caribbean	22	95	33	39	33	32
Central America	4	62	52	40	25	18
North America	4	91	5	4	3	2
Total North and Central America	**30**	**90**	**7**	**6**	**5**	**4**
Total Oceania	**18**	**100**	**95**	**85**	**76**	**78**
Total South America	**9**	**75**	**98**	**98**	**98**	**97**
WORLD	**170**	**85**	**34**	**35**	**39**	**44**

countries (Table 26). Among the regions, North and Central America has the largest area of primary forest, at 313 million ha, followed by South America (299 million ha) and Europe (259 million ha) (although, if the Russian Federation is excluded, Europe would have only 4.18 million ha). Africa has an estimated 150 million ha of primary forest, Asia 86.4 million ha and Oceania 2.62 million ha.

Primary forest accounts for 49 percent of the total forest area in South America, 43 percent in North and Central America, 38 percent in Africa, 27 percent in Europe (or 3 percent if the Russian Federation is excluded) and 21 percent in Oceania. Asia has the lowest area of primary forest as a proportion of its total forest area, at 15 percent. Table 27 shows the top five countries for primary forest area in 2020.

Primary forests account for 95 percent or more of the total forest area in three countries and territories: Suriname, Venezuela (Bolivarian Republic of) and French Guyana (Table 28).

TRENDS

FRA 2020 received information on trends in the area of primary forest from 137 countries and territories, representing 57 percent of the world's forest area. The low number of countries and territories reporting on this parameter, and the use of proxies such as the area of forest in protected areas and other types of forest reserve, reduces the reliability of the trend analysis, and the findings here should be treated with caution. Moreover, the data do not

TABLE 26. Area of primary forest, by region and subregion, 2020

Region/subregion	Data availability		Primary forest (1 000 ha)	% of total forest area of reporting countries	Share of global area of primary forest (%)
	No. of reporting countries	% of total forest area			
Eastern and Southern Africa	10	49	59 412	41	5.4
Northern Africa	5	77	1 284	5	0.1
Western and Central Africa	16	72	88 891	40	8.0
Total Africa	**31**	**62**	**149 586**	**38**	**13.5**
East Asia	3	95	16 799	6	1.5
South and Southeast Asia	12	87	67 351	26	6.1
Western and Central Asia	18	95	2 241	4	0.2
Total Asia	**33**	**91**	**86 392**	**15**	**7.8**
Europe excl. Russian Federation	41	77	4 180	3	0.4
Total Europe	**42**	**95**	**259 392**	**27**	**23.4**
Caribbean	13	67	184	3	0.0
Central America	1	16	658	19	0.1
North America	4	100	312 471	43	28.2
Total North and Central America	**18**	**97**	**313 313**	**43**	**28.2**
Total Oceania	**14**	**7**	**2 617**	**21**	**0.2**
Total South America	**8**	**72**	**298 698**	**49**	**26.9**
WORLD	**146**	**81**	**1 109 997**	**34**	**100.0**

TABLE 27. Top five countries for primary forest area, 2020

Ranking	Country	Area of primary forest (1 000 ha)	Share of global primary forest area of reporting countries (%)	Cumulative %
1	Russian Federation	255 212	23	23
2	Brazil	216 187	19	42
3	Canada	205 131	18	61
4	Democratic Republic of the Congo	82 752	7	68
5	United States of America	75 300	7	75

indicate whether decreases in the area of primary forest are due to deforestation or to conversion to another forest type (such as naturally regenerating or planted forest).

Note that the data reported by the Russian Federation have been excluded from the regional and global analysis of trends. The reason for this is that, in the absence of information on primary forest area in that country, the area of intact forest landscapes was used as a proxy; this, in turn, means substantial changes over time, which would have a considerable impact on global and regional trends.

Globally, the area of primary forest decreased by 81.3 million ha between 1990 and 2020. The average annual rate of loss was 3.41 million ha in 1990–2000 and 3.45 million ha in 2000–2010; the rate dropped substantially in the most recent decade, to 1.27 million ha (Table 29).

The biggest average annual loss of primary forest area in 2010–2020 was in Africa, at 849 000 ha, up from 611 000 ha in 1990–2000 and 585 000 ha in 2000–2010. The increase in the most recent decade was due largely to the Democratic Republic of the Congo, where the average annual rate of loss was 723 000 ha in 2010–2020, up from 442 000 ha in 1990–2010.

The average annual rate of loss of primary forest in South America was substantially lower in the most recent decade compared with the previous 20 years. It was 1.75 million ha per year in 1990–2000 and 2.27 million ha per year in 2000–2010 but only 323 000 ha in 2010–2020. The decrease was due mainly to Brazil, where the rate of average annual loss of primary forest was 1.41 million ha in 1990–2000 and 2.08 million ha in 2000–2010 before plummeting to 201 000 ha in the most recent decade.

TABLE 28. Top five countries and territories for primary forest as a proportion of total forest area, 2020

Ranking	Country/territory	Area of primary forest (1 000 ha)	% of total forest area
1	Suriname	14 833	98
2	Venezuela (Bolivarian Republic of)	44 873	97
3	French Guyana	7 640	95
4	Micronesia (Federated States of)	48	75
5	Tajikistan	296	70

TABLE 29. Area of primary forest and annual change, by region and subregion, 1990–2020

Region/subregion	Data availability		Primary forest (1 000 ha)				Annual change (1 000 ha/yr)		
	No. of reporting countries	% of total forest area	1990	2000	2010	2020	1990–2000	2000–2010	2010–2020
Eastern and Southern Africa	9	27	34 179	33 591	32 849	32 669	-59	-74	-18
Northern Africa	5	77	1 650	1 528	1 406	1 284	-12	-12	-12
Western and Central Africa	16	72	107 463	102 063	97 075	88 891	-540	-499	-818
Total Africa	**30**	**51**	**143 291**	**137182**	**131 329**	**122 843**	**-611**	**-585**	**-849**
East Asia	3	95	15 410	15 507	16 223	16 799	10	72	58
South and Southeast Asia	11	85	82 716	75 109	67 682	66 825	-761	-743	-86
Western and Central Asia	18	95	2 139	2 156	2 173	2 241	2	2	7
Total Asia	**32**	**90**	**100 265**	**92 772**	**86 078**	**85 866**	**-749**	**-669**	**-21**
Total Europe	**35**	**44**	**853**	**988**	**1 319**	**1 406**	**14**	**33**	**9**
Caribbean	13	67	192	190	187	184	0	0	0
Central America	1	16	878	778	689	658	-10	-9	-3
North America	4	100	315 701	312 652	313 113	312 471	-305	46	-64
Total North and Central America	**18**	**97**	**316 772**	**313 621**	**313 989**	**313 313**	**-315**	**37**	**-68**
Total Oceania	**14**	**7**	**2 748**	**2 774**	**2 801**	**2 617**	**3**	**3**	**-18**
Total South America	**8**	**72**	**342 109**	**324 607**	**301 926**	**298 698**	**-1 750**	**-2 268**	**-323**
WORLD	**137**	**57**	**906 038**	**871 944**	**837 442**	**824 742**	**-3 409**	**-3 450**	**-1 270**

TABLE 30. Area of mangroves, by region and subregion, 2020

Region/subregion	Mangrove area (1 000 ha)
Eastern and Southern Africa	905
Northern Africa	31
Western and Central Africa	2 304
Total Africa	**3 240**
East Asia	32
South and Southeast Asia	5 331
Western and Central Asia	184
Total Asia	**5 547**
Total Europe	**0**
Caribbean	892
Central America	484
North America	1 195
Total North and Central America	**2 571**
Total Oceania	**1 298**
Total South America	**2 130**
WORLD	**14 786**

There was a decrease in the average annual rate of primary forest loss in Asia, from 749 000 ha in 1990–2000 and 669 000 ha in 2000–2010 to 21 300 ha in 2010–2020. The decline was due largely to a substantial drop in Indonesia, where the average annual rate of loss declined from 713 000 ha in 2000–2010 to 85 700 ha in 2010–2020.

In North and Central America, the area of primary forest declined at a rate of 315 000 ha per year in 1990–2000, increased by 36 800 ha per year in 2000–2010, and declined again at a rate of 67 600 ha per year in 2010–2020. The shift from loss to gain in 2000–2010 mainly reflected the situation in Mexico, where the rate of loss of primary forest more than halved from 506 000 ha per year in 1990–2000 to 224 000 ha per year in 2000–2010. The trend was also affected by data reported by the United States of America indicating an average annual increase in primary forest area of 229 000 ha per year in 1990–2000, 299 000 ha in 2000–2010 and 600 ha in 2010–2020; in this case, however, estimates of primary forest area are based on the area of reserved forest, and the increase in primary forest area mainly reflects changes in designation status rather than an actual change in primary forest area.

Europe, excluding the Russian Federation, has recorded net gains in primary forest area in each of the last three decades, at an average annual rate of 13 500 ha in 1990–2000, 33 000 ha in 2000–2010 and 8 710 ha in 2010–2020. These increases, however, reflect changes in proxies such as the area of forest in protected areas and therefore are not necessarily a true indication of primary-forest-area dynamics.

Insufficient data were available for Oceania (with reporting countries representing only 7 percent of the region's forest area) to derive valid regional findings. New Zealand reported a relatively stable primary forest area in 1990–2000 and 2000–2010 and an average annual decrease of 18 100 ha in 2010–2020.

Mangroves

Mangroves are assemblages of salt-tolerant shrubs and trees that grow in intertidal regions of tropical, subtropical and some temperate coastlines, where they fulfil important environmental and socio-economic functions. For example, mangrove ecosystems produce a wide range of wood and non-wood forest products, help protect coastal areas and coral reefs, perform important functions in the life-cycles of many marine species, and conserve biodiversity.

STATUS

FRA 2020 received information on mangroves for 2020 from 223 countries and territories, of which 113 indicated that they have areas of mangrove forest (the remaining 110 reported that they have no mangroves). Globally, the area of mangroves is estimated at 14.8 million ha; Asia has the largest area (5.55 million ha), followed by Africa, North and Central America, South America and Oceania (Table 30). Europe reported no mangrove area. More than 40 percent of the global area of mangroves is in four countries: Indonesia (19 percent of the global total), Brazil (9 percent), Nigeria (7 percent) and Mexico (6 percent).

TRENDS

FRA 2020 received information on trends in mangrove area from 218 countries and territories (of which 108 have mangroves).[13]

Globally, the area of mangroves decreased by 1.04 million ha between 1990 and 2020 (Table 31). The rate of loss more than halved over the three decades, from 46 700 ha per year in 1990–2000, to 36 300 ha per year in 2000–2010, to 21 200 ha per year in the most recent decade.

In Africa, the average annual rate of loss dropped from 6 610 ha in 1990–2000 to 2 330 ha in 2010–2020. There was also a decline in the rate of loss in Oceania, from 29 600 ha per year in 1990–2000 to 5 900 ha per year in the most recent decade.

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[13] Note that changes in assessment methodologies in several countries mean that estimates of mangrove area for the various periods may not be directly comparable. These results, therefore, should be treated with caution.

TABLE 31. Area of mangroves and annual change, by region and subregion, 1990–2020

Region/subregion	Mangrove area (1 000 ha)				Annual change (1 000 ha/yr)		
	1990	2000	2010	2020	1990–2000	2000–2010	2010–2020
Eastern and Southern Africa	929	902	883	905	-2.7	-1.9	2.2
Northern Africa	34	31	32	31	-0.3	0.1	-0.1
Western and Central Africa	2 436	2 400	2 349	2 304	-3.6	-5.1	-4.5
Total Africa	**3 398**	**3 332**	**3 264**	**3 240**	**-6.6**	**-6.9**	**-2.3**
East Asia	24	22	25	32	-0.2	0.3	0.7
South and Southeast Asia	6 117	6 108	5 713	5 330	-0.8	-39.6	-38.3
Western and Central Asia	190	190	190	184	0.0	0.0	-0.7
Total Asia	**6 331**	**6 320**	**5 928**	**5 545**	**-1.0**	**-39.3**	**-38.2**
Total Europe	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Caribbean	787	789	774	891	0.2	-1.6	11.7
Central America	492	482	483	466	-1.0	0.1	-1.8
North America	1 152	1 167	1 190	1 195	1.5	2.3	0.5
Total North and Central America	**2 431**	**2 439**	**2 447**	**2 552**	**0.8**	**0.8**	**10.5**
Total Oceania	**1 447**	**1 150**	**1 314**	**1 255**	**-29.6**	**16.4**	**-5.9**
Total South America	**2 152**	**2 050**	**1 976**	**2 124**	**-10.2**	**-7.4**	**14.8**
WORLD	**15 759**	**15 292**	**14 928**	**14 717**	**-46.7**	**-36.3**	**-21.2**

There was an increase in the area of mangroves in South America in 2010–2020 at an average annual rate of 14 800 ha, reversing the declining trend in 1990–2000, when the region lost mangroves at a rate of 10 200 ha per year. This reversal was due mainly to Guyana, which reported an average annual increase in mangrove area of 19 500 ha in 2010–2020, due partly to a mangrove restoration project and partly to improvements in mapping (and therefore the increase does not necessarily reflect actual changes in mangrove area).

There was also an increase in mangrove area in North and Central America in 2010–2020, at an average annual rate of 10 500 ha (there was minimal change between 1990 and 2010). The increase in the region in 2010–2020 was attributable mainly to Cuba, which reported a gain of 12 000 ha per year in that period. As in the case of Guyana, this increase was due partly to improved data collection and partly to restoration programmes and does not necessarily reflect actual changes in mangrove area.

There was a substantial increase in the average annual rate of mangrove loss in Asia, from 1 030 ha in 1990–2000 to 38 200 ha in 2010–2020. The increased rate of loss was due mainly to Indonesia, which reported an average annual loss of 6 800 ha in 1990–2000 and 21 100 ha in the most recent decade.

Bamboo

Bamboo is a widely distributed grass in the tropical, subtropical and temperate climatic domains. It is an

TABLE 32. Area of bamboo, by region and subregion, 2020

Region/subregion	Bamboo area (1 000 ha)
Eastern and Southern Africa	3 984
Northern Africa	30
Western and Central Africa	634
Total Africa	**4 648**
East Asia	7 005
South and Southeast Asia	17 872
Western and Central Asia	0
Total Asia	**24 877**
Total Europe	**0**
Caribbean	125
Central America	0
North America	0
Total North and Central America	**125**
Total Oceania	**0**
Total South America	**5 389**
WORLD	**35 040**

FIGURE 13. Total area of bamboo, 1990–2020

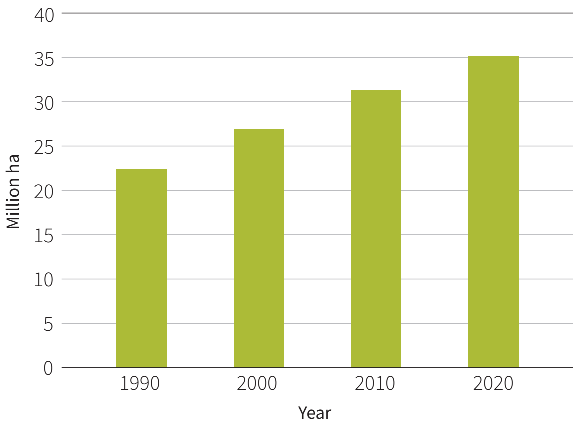
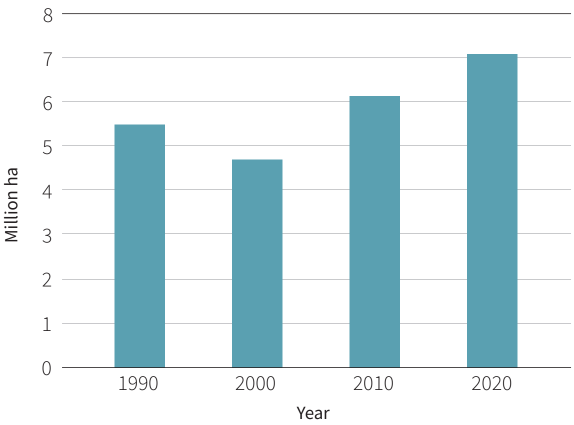


FIGURE 14. Total area of rubber plantations, 1990–2020



important non-wood forest product with many traditional uses and also an important industrial material for construction and furniture, either in its natural form or as a reconstituted material (e.g. laminated boards and panels). Bamboo shoots are an increasingly mainstream food.

TABLE 33. **Area of rubber plantations, by reporting country, 2020**

Ranking	Country/territory	Area of rubber plantations (1 000 ha)
1	Thailand	3 537
2	Malaysia	1 073
3	India	882
4	Cambodia	559
5	Côte d'Ivoire	542
6	Viet Nam	500
7	Guinea**	237
8	Sri Lanka	137
9	Guatemala*	82.4
10	Colombia*	58.3
11	Cameroon	54.0
12	Bangladesh*	23.7
13	Gabon	23.0
14	Papua New Guinea	11.7
15	Ecuador*	6.22
16	Zambia*	1.00
17	Nepal	1.00
	TOTAL	**7 728**

Note: * Did not report for 2020; data for 2015 used for 2020. ** Did not report for 2020; data for 2010 used for 2020.

STATUS AND TRENDS

Of the 132 countries that reported on bamboo for FRA 2020, 23 indicated that they had bamboo resources. The total estimated bamboo resource in these countries is 35.0 million ha, of which 24.9 million ha (71 percent of the total bamboo area) is in Asia (Table 32).

The total area of bamboo increased by almost 50 percent between 1990 and 2020 (Figure 13), largely because of increases in China and India.

Rubber plantations

Rubber plantations are important in some regions, especially Asia. Although their main purpose is latex production, they are included in FRA 2020 because rubberwood is an important timber product. Some countries categorize rubber plantations as agricultural tree crops, however, and do not include them in their forest statistics.

STATUS AND TRENDS

Seventeen of the 167 countries and territories that reported on this parameter for FRA 2020 indicated that they had areas of rubber plantation. Several important rubber-producing countries did not report on their rubber plantation resources and are missing from the totals reported here, which therefore are likely to underestimate the global rubber plantation resource.

The total area of rubber plantations in the 17 reporting countries is estimated at 7.73 million ha, of which 87 percent is in South and Southeast Asia (Table 33). The total area of rubber plantations increased by an estimated 1.99 million ha between 1990 and 2020 (Figure 14).

4

Growing stock, biomass and carbon

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Growing stock – the total volume of living trees in a forest – has been assessed in every previous FRA. This parameter provides information on existing wood resources; when expressed as growing stock per unit area, it indicates how well or poorly stocked a forest is. In FRA 2020, information was collected from countries and territories on total growing stock and growing stock per hectare for both naturally regenerating and planted forests and for the total forest resource.

Many countries use growing stock as the basis for estimating biomass and carbon stocks. Forest biomass, expressed in terms of dry weight of living vegetation, is an important indicator of a forest's productivity and its capacity to sequester and store carbon. Forest ecosystems are the largest terrestrial carbon sink, and knowledge on the status of, and trends in, the various forest carbon pools is important for understanding the role of forests in the global carbon cycle.

The United Nations Framework Convention on Climate Change (UNFCCC) requests all countries to periodically assess and report on national greenhouse-gas emissions, including emissions and removals of carbon on forest land. The Intergovernmental Panel on Climate Change (IPCC) has developed guidelines and methodologies for ensuring the consistent reporting of emissions over time.

FRA 2020 uses the same carbon pools and definitions as those in the IPCC guidelines, and it recommended that countries follow the IPCC guidelines for reporting on carbon stocks.[14] Nevertheless, the data reported to FRA 2020 do not always correspond with the data reported to the UNFCCC. There are several possible reasons for this: for example, forest definitions may vary; the UNFCCC requests countries to report on "managed forests", which may comprise all or only part of a country's forest resource; and FRA-specific methods related to, for example, calibration, reclassification, estimation and forecasting are usually implemented differently in reporting to the UNFCCC.

Data on growing stock, biomass and carbon are improving as more countries conduct national forest inventories as part of their national forest monitoring systems. In many cases, however, historical data are weak, affecting the reliability of trend analyses. Most countries have only one estimate of growing stock per unit area; for those countries, estimates of changes in growing stock are mainly extrapolated from changes in forest area. The same issue also applies to biomass and carbon. Estimates of carbon in dead wood, litter and soil are especially weak, with many countries not reporting on these carbon pools.

FRA 2020 sought information on the composition of growing stock. Information on growing-stock composition and the diversity of tree species in general is crucial not only for managing forests sustainably and developing new tree-based products but also for optimizing the role of forests in mitigating and adapting to climate change. Many countries were unable to report their growing-stock composition, even by the most common native and introduced tree species, and relatively few countries reported full time series for growing-stock composition. Inconsistencies were also found in the taxonomic nomenclature used by countries, which were often not in accordance with globally agreed taxonomic checklists. Increasing the availability and quality of data on growing-stock composition is a formidable task for many countries, especially in the tropics, where the diversity of tree species is very high. Fortunately, tools such as national tree checklists and field identification guides are increasingly available for this purpose. Recently, too, a global checklist of tree species was made available in the GlobalTreeSearch database,[15] which includes data on more than 60 000 tree species worldwide and is continuously updated.

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[14] The IPCC recently published an update of its guidelines on national greenhouse-gas inventories (IPCC, 2019), which contains improved conversion factors for carbon estimation; this will help improve estimates for countries lacking national data on biomass and carbon.

[15] https://tools.bgci.org/global_tree_search.php

TABLE 34. Volume of forest growing stock, by region and subregion, 2020

Region/subregion	Total growing stock (million m^3)	Growing stock per unit area (m^3/ha)
Eastern and Southern Africa	19 146	64.7
Northern Africa	841	23.9
Western and Central Africa	56 419	184.6
Total Africa	**76 406**	**120.0**
East Asia	27 049	99.7
South and Southeast Asia	31 518	106.5
Western and Central Asia	3 935	71.2
Total Asia	**62 502**	**100.4**
Europe excl. Russian Federation	35 158	173.9
Total Europe	**116 230**	**114.2**
Caribbean	725	91.9
Central America	4 233	188.9
North America	90 108	124.7
Total North and Central America	**95 067**	**126.3**
Total Oceania	**18 867**	**101.8**
Total South America	**187 455**	**222.1**
WORLD	**556 526**	**137.1**

Growing stock

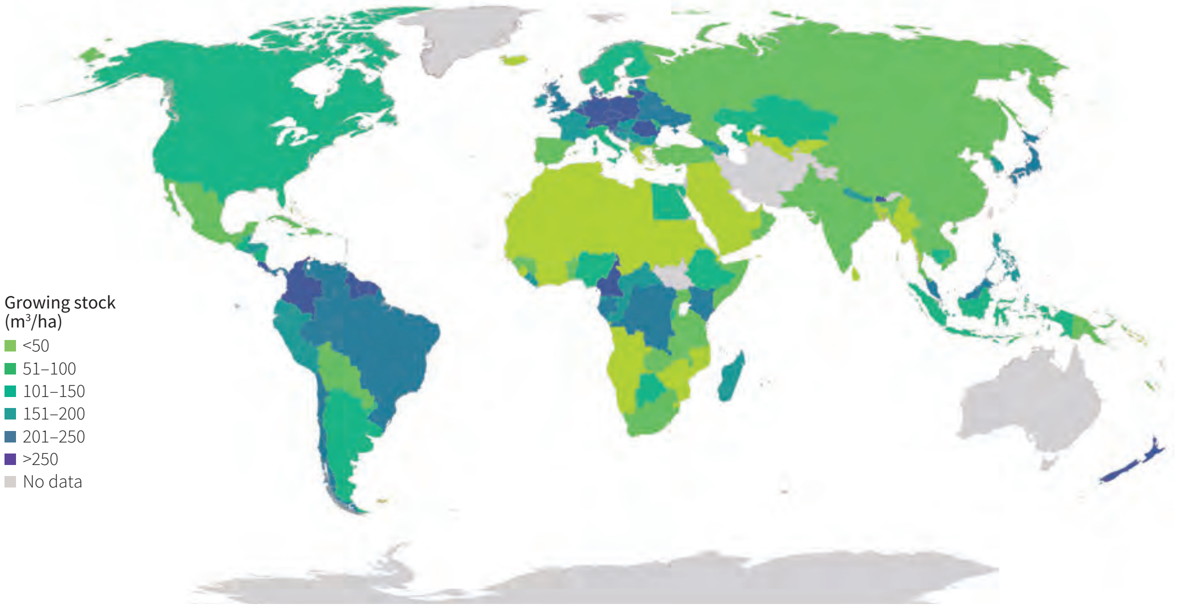
STATUS

FRA 2020 received information on growing stock in 2020 from 183 countries and territories, representing 95 percent of the world's forests. For countries and territories that provided no information on this parameter, growing stock was estimated by multiplying subregional averages of growing stock per hectare by total forest area.

The world's total forest growing stock is estimated at 557 billion m^3. Growing stock per unit area is highest in the tropics, led by South America, Central America and Western and Central Africa (in descending order), but it is also high in some regions – such as Europe – with temperate and boreal forests (Table 34; Figure 15). Among countries, Brazil is estimated to have the largest forest growing stock, at 120 billion m^3; this amounts to almost 22 per cent of the world's total growing stock. The Russian Federation, Canada and the United States of America also have very large volumes of growing stock (Table 35).

FRA 2020 received information on the distribution of growing stock in 2020 from 157 countries and territories representing 92 per cent of the world's total growing stock. Globally, 95 percent of the growing stock is held in naturally regenerating forest, with planted forests accounting for 5 percent. The average growing stock per unit area is higher in naturally regenerating forest (140 m^3 per ha) than in planted forest (110 m^3 per ha). One reason for this is that there has been a large increase in the area of

FIGURE 15. Forest growing stock per unit area, by country, 2020



Source: Adapted from United Nations World map, 2020

TABLE 35. Top ten countries for volume of forest growing stock, 2020

Ranking	Country	Growing stock (million m³)
1	Brazil	120 358
2	Russian Federation	81 071
3	Canada	45 108
4	United States of America	41 269
5	Democratic Republic of the Congo	30 782
6	China	19 191
7	Colombia	14 830
8	Indonesia	12 727
9	Peru	11 525
10	Venezuela (Bolivarian Republic of)	10 254

planted forests, and recent plantings are yet to achieve high volumes of growing stock. Among the regions, Asia has the highest proportion of growing stock in planted forests and Africa the lowest (Figure 16).

TRENDS

FRA 2020 received complete time series on growing stock for 1990–2020 from 182 countries and territories representing 95 percent of the world's forest area. For countries that did not provide such data, growing stock was estimated by taking subregional averages of growing stock per hectare and multiplying these by forest area (as estimated for each point in the time series). For countries that provided incomplete time series, the missing data were estimated by using the value for growing stock per hectare of the nearest data point. A complete dataset with no gaps was obtained using this procedure.

Although total growing stock declined slightly between 1990 and 2020 (Table 36), it increased per unit area (Table 37). The latter is true for all regions and subregions and is particularly significant in East Asia and Europe (excluding the Russian Federation). The increase in East Asia is due to significant increases in growing stock in China, Japan and the Republic of Korea, all of which have undertaken major reforestation programmes in recent decades. The increase in Europe follows a long-term trend and is likely due to the widespread use of forest management practices that encourage forest growth.

There was a significant increase in the proportion of total forest growing stock in planted forests between 1990 and 2020 (Figure 17, p. 47) . This finding holds for all regions, with the most significant increases in East Asia, North and Central America, South America and Oceania.

Growing-stock composition

STATUS

FRA 2020 received information on the composition of forest growing stock (i.e. whether comprising native or introduced tree species) in 2020 from 75 countries and territories representing 62 percent of the world's forest area and almost half its growing stock.

It is estimated that, globally, 92 percent of the growing stock consists of native tree species and 8 percent comprises introduced tree species. Native tree species dominate the composition of growing stock in all regions, with the share highest in Asia (98 percent) and lowest in Africa (86 percent).

The most common native and introduced tree species in the growing stock reported for FRA 2020 belong to

FIGURE 16. Naturally regenerating and planted forest growing stock distribution, by region, 2020

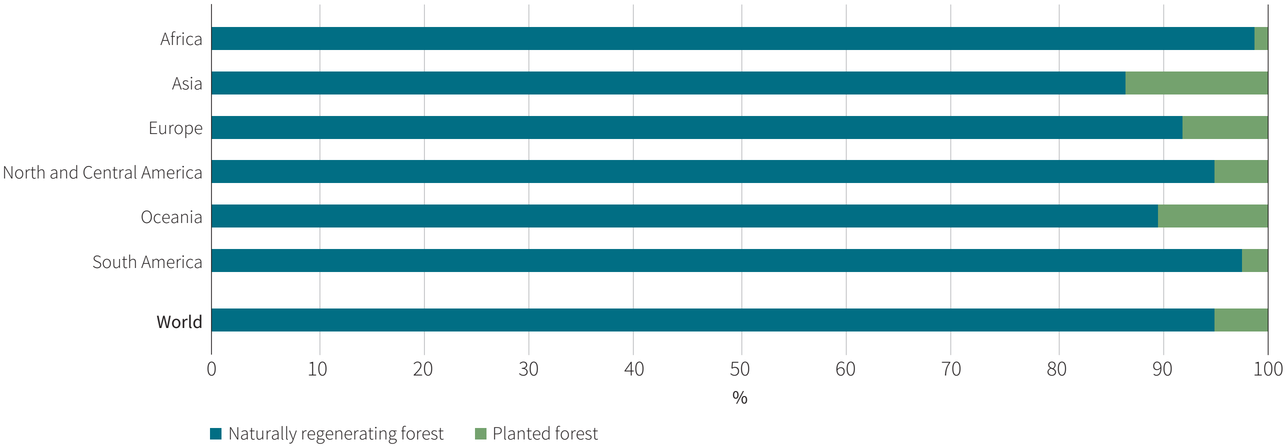


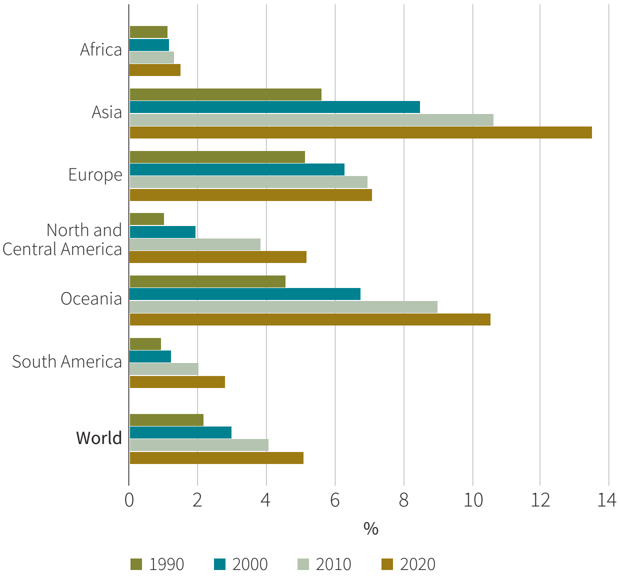
TABLE 36. Total volume of forest growing stock, by region and subregion, 1990–2020

Region/subregion	Forest growing stock (million m³)			
	1990	2000	2010	2020
Eastern and Southern Africa	21 915	21 273	20 337	19 146
Northern Africa	891	876	872	841
Western and Central Africa	64 835	62 213	59 780	56 419
Total Africa	**87 640**	**84 361**	**80 989**	**76 406**
East Asia	15 657	18 390	22 226	27 049
South and Southeast Asia	33 288	32 815	32 506	31 518
Western and Central Asia	2 646	3 085	3 464	3 935
Total Asia	**51 591**	**54 290**	**58 196**	**62 502**
Europe excl. Russian Federation	24 245	27 817	31 539	35 158
Total Europe	**104 285**	**108 087**	**113 062**	**116 230**
Caribbean	544	617	683	725
Central America	5 118	4 762	4 429	4 233
North America	84 684	86 432	88 141	90 108
Total North and Central America	**90 346**	**91 811**	**93 253**	**95 067**
Total Oceania	**18 713**	**18 706**	**18 798**	**18 867**
Total South America	**207 186**	**199 019**	**190 753**	**187 455**
WORLD	**559 761**	**556 276**	**555 050**	**556 526**

TABLE 37. Volume of forest growing stock per hectare, by region and subregion, 1990–2020

Region/subregion	Forest growing stock (m³/ha)			
	1990	2000	2010	2020
Eastern and Southern Africa	63.3	64.0	64.6	64.7
Northern Africa	22.3	23.0	23.7	23.9
Western and Central Africa	181.7	183.3	184.3	184.6
Total Africa	**118.0**	**118.8**	**119.8**	**120.0**
East Asia	74.6	80.3	88.1	99.7
South and Southeast Asia	102.0	106.5	106.4	106.5
Western and Central Asia	54.0	61.4	65.2	71.2
Total Asia	**88.1**	**92.4**	**95.3**	**100.4**
Europe excl. Russian Federation	130.8	144.1	158.6	173.9
Total Europe	**104.9**	**107.8**	**111.5**	**114.2**
Caribbean	91.3	90.7	91.1	91.9
Central America	182.8	184.4	186.8	188.9
North America	117.4	120.1	121.9	124.7
Total North and Central America	**119.6**	**122.0**	**123.6**	**126.3**
Total Oceania	**101.2**	**102.0**	**103.8**	**101.8**
Total South America	**212.8**	**215.7**	**219.2**	**222.1**
WORLD	**132.1**	**133.8**	**135.2**	**137.1**

FIGURE 17. Proportion of growing stock in planted forest, by region, 1990–2020



202 genera. Many country reports were incomplete in the information provided on this attribute, however, and several countries that did report could only do so at the genus level. Figures 18 to 21 show the reported top five genera, by volume and region (or subregion in the case of North America), in the forest growing stock of reporting countries (note, however, that reporting was insufficient for some regions and subregions and therefore those are not represented below).

TRENDS

Trends in the species composition of forest growing stock cannot be assessed reliably because of the incompleteness of data on this attribute. Nevertheless, the available data suggest that the share of introduced tree species increased between 1990 and 2020 in all regions except Asia and

FIGURE 18. Volume of growing stock for the top five genera, Africa, 2020

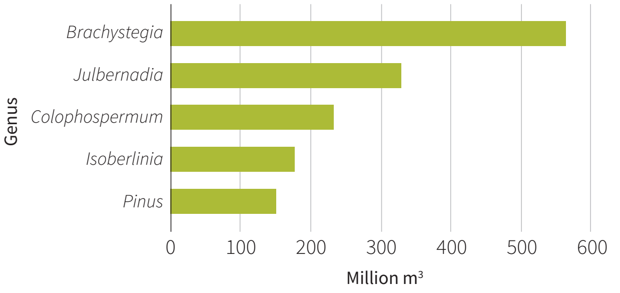


FIGURE 19. Volume of growing stock for the top five genera, Asia, 2020

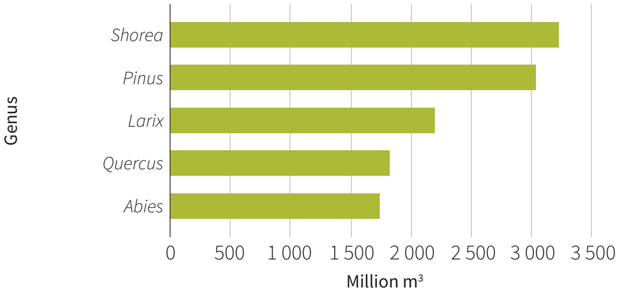


FIGURE 20. Volume of growing stock for the top five genera, Europe, 2020

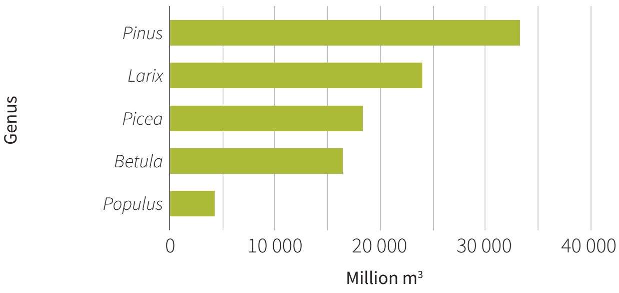
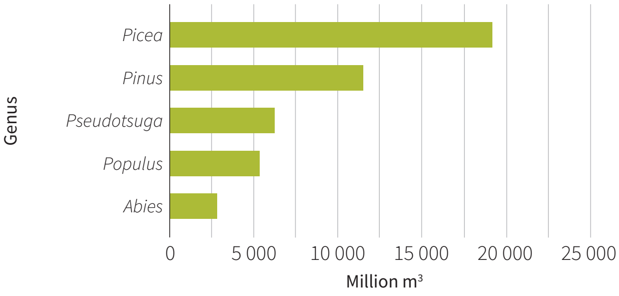


FIGURE 21. Volume of growing stock for the top five genera, North America, 2020



Note: Only North America is shown here because insufficient data were available for Central America and the Caribbean. In this figure, an estimate was made for Canada based on the share of growing-stock composition reported by that country for 2000 multiplied by the total growing stock reported for 2020.

TABLE 38. Biomass and dead-wood stock, by region and subregion, 2020

Region/subregion	Biomass		Dead wood	
	Million tonnes	tonnes/ha	Million tonnes	tonnes/ha
Eastern and Southern Africa	27 855	94.2	1 577	5.3
Northern Africa	2 293	65.2	17	0.5
Western and Central Africa	76 837	251.3	1 851	6.1
Total Africa	**106 985**	**168.0**	**3 444**	**5.4**
East Asia	23 958	88.3	3 326	12.3
South and Southeast Asia	49 911	168.6	320	1.1
Western and Central Asia	4 885	88.4	40	0.7
Total Asia	**78 754**	**126.5**	**3 685**	**5.9**
Europe excl. Russian Federation	28 335	140.2	1 603	7.9
Total Europe	**109 817**	**107.9**	**16 263**	**16.0**
Caribbean	1 035	131.2	69	8.8
Central America	3 752	167.5	248	11.1
North America	78 829	109.1	19 781	27.4
Total North and Central America	**83 616**	**111.1**	**20 099**	**26.7**
Total Oceania	**28 264**	**152.6**	**4 699**	**25.4**
Total South America	**198 556**	**235.2**	**10 839**	**12.8**
WORLD	**605 993**	**149.3**	**59 029**	**14.5**

North America (where it remained at about 2 percent and 4 percent, respectively, over the period). Globally, the share of introduced tree species increased from 6 percent in 1990 to 8 percent in 2020.

Biomass stock

STATUS

FRA 2020 received information on forest biomass in 2020 from 193 countries and territories representing 99 percent of the world's forests. Data on dead wood were reported by 78 countries and territories (accounting for 74 percent of the world's forests). For those countries and territories that provided no data, biomass and dead wood were estimated by multiplying subregional averages per hectare by forest area (as estimated for each point in the time series).

The total living biomass in the world's forests amounts to almost 606 gigatonnes (Gt) (Table 38), or about 149 tonnes per ha. The highest biomass stock per hectare was in regions with tropical forests – with values above 200 tonnes per ha in South America and Western and Central Africa. Dead wood in the world's forests is estimated at 59.0 Gt of dry matter (equivalent to 14.5 tonnes per ha).

Many countries used the default conversion factors provided by the IPCC to estimate biomass from growing stock, although an increasing number of countries are developing estimates based on national data. Table 39 shows the average biomass conversion and expansion factor (BCEF),[16] root–shoot ratio[17] and dead–live ratio,[18] by subregion, based on estimates of growing stock and biomass for 2020. The calculated factors are well within the range of default values presented in the IPCC guidelines.

TRENDS

FRA 2020 received complete time-series data on above- and below-ground forest biomass from 189 countries and territories representing more than 95 per cent of the global forest area. For non-reporting countries and territories, biomass was estimated by multiplying the subregional averages of biomass per hectare by forest area (as estimated for each point in the time series).

The global biomass stock decreased by about 8 Gt between 1990 and 2020 (Table 40). The largest decreases

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[16] The BCEF is calculated as above-ground biomass in tonnes divided by growing stock in m^3.

[17] The root–shoot ratio is calculated as below-ground biomass divided by above-ground biomass.

[18] The dead–live ratio is calculated as the dry weight of dead wood divided by the total living biomass (above-ground and below-ground).

TABLE 39. Forest biomass conversion and expansion factor, root–shoot ratio and dead–live ratio, by region and subregion, 2020

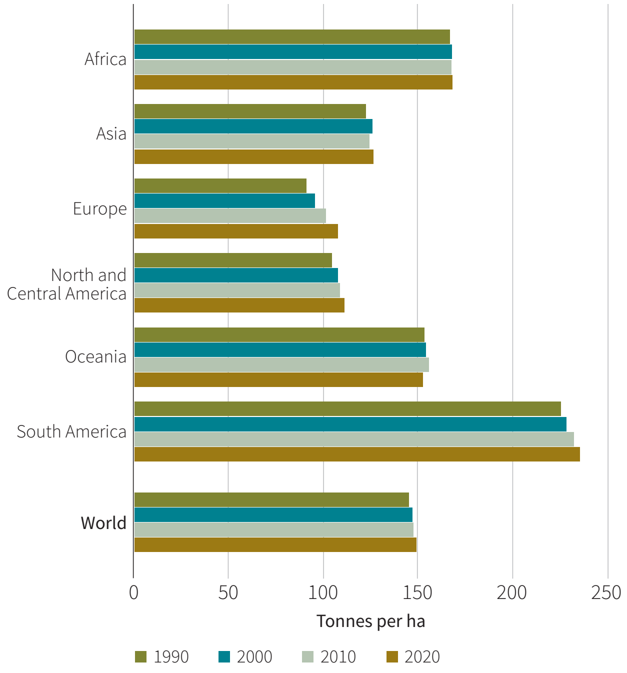
Region/subregion	BCEF	Root–shoot ratio	Dead–live ratio
Eastern and Southern Africa	1.14	0.27	0.06
Northern Africa	2.11	0.29	0.01
Western and Central Africa	1.04	0.31	0.02
Total Africa	**1.07**	**0.30**	**0.03**
East Asia	0.70	0.26	0.14
South and Southeast Asia	1.25	0.26	0.01
Western and Central Asia	0.97	0.29	0.01
Total Asia	**1.00**	**0.26**	**0.05**
Europe excl. Russian Federation	0.65	0.25	0.06
Total Europe	**0.74**	**0.28**	**0.15**
Caribbean	1.14	0.25	0.07
Central America	0.70	0.27	0.07
North America	0.71	0.23	0.25
Total North and Central America	**0.71**	**0.23**	**0.24**
Total Oceania	**1.13**	**0.33**	**0.17**
Total South America	**0.85**	**0.24**	**0.05**
WORLD	**0.86**	**0.26**	**0.10**

Note: BCEF = biomass conversion and expansion factor.

TABLE 40. Total living biomass, by region and subregion, 1990–2020

Region/subregion	Living biomass (million tonnes)			
	1990	2000	2010	2020
Eastern and Southern Africa	32 813	31 391	29 718	27 855
Northern Africa	2 572	2 485	2 408	2 293
Western and Central Africa	88 929	85 219	81 577	76 837
Total Africa	**124 314**	**119 095**	**113 703**	**106 985**
East Asia	14 417	17 031	19 717	23 958
South and Southeast Asia	53 790	52 879	51 657	49 911
Western and Central Asia	3 661	4 015	4 567	4 885
Total Asia	**71 868**	**73 924**	**75 941**	**78 754**
Europe excl. Russian Federation	19 332	22 042	25 085	28 335
Total Europe	**90 713**	**95 629**	**102 995**	**109 817**
Caribbean	766	874	976	1 035
Central America	4 514	4 198	3 917	3 752
North America	73 887	76 010	77 282	78 829
Total North and Central America	**79 166**	**81 082**	**82 174**	**83 616**
Total Oceania	**28 396**	**28 254**	**28 225**	**28 264**
Total South America	**219 518**	**210 979**	**202 309**	**198 556**
WORLD	**613 975**	**608 963**	**605 348**	**605 993**

FIGURE 22. Regional and global trends in biomass stock per hectare, by region, 1990–2020



were in Africa and South America, mainly because of declines in forest area. In contrast, Asia, Europe and North America all showed increases in total biomass stock.

Biomass stock per hectare increased between 1990 and 2020 in all regions except Africa and Oceania, where this attribute was relatively stable (Figure 22).

Only 72 countries and territories, representing 68 percent of the world's forest area, reported complete time series for dead-wood stock; estimates for this carbon pool, therefore, are less reliable than for living biomass. For non-reporting countries, the dead-wood stock was estimated by multiplying the subregional averages per hectare by forest area (as estimated for each point in the time series). Globally, the stock of dead wood was reasonably stable between 1990 and 2020 (Table 41). There were regional differences, however, with dead-wood stocks decreasing in Africa and South America (due mainly to reductions in forest area) and increasing in Asia, Europe and North America.

TABLE 41. Dead-wood stock, by region and subregion, 1990–2020

Region/subregion	Dead wood (million tonnes)			
	1990	2000	2010	2020
Eastern and Southern Africa	1 877	1 794	1 685	1 577
Northern Africa	20	19	18	17
Western and Central Africa	2 738	2 345	2 112	1 851
Total Africa	**4 635**	**4 158**	**3 815**	**3 444**
East Asia	2 219	2 516	2 896	3 326
South and Southeast Asia	356	334	332	320
Western and Central Asia	28	32	36	40
Total Asia	**2 603**	**2 882**	**3 265**	**3 685**
Europe excl. Russian Federation	1 179	1 273	1 526	1 603
Total Europe	**14 831**	**14 995**	**15 804**	**16 263**
Caribbean	53	59	65	69
Central America	302	281	260	248
North America	19 120	19 026	19 736	19 781
Total North and Central America	**19 475**	**19 366**	**20 061**	**20 099**
Total Oceania	**4 740**	**4 710**	**4 716**	**4 699**
Total South America	**12 051**	**11 577**	**11 082**	**10 839**
WORLD	**58 336**	**57 689**	**58 742**	**59 029**

TABLE 42. Forest carbon stock in carbon pools, by region and subregion, 2020

Region/subregion	Carbon in living biomass		Carbon in dead wood and litter		Carbon in soil		Total carbon	
	Million tonnes	tonnes/ha	Million tonnes	tonnes/ha	Million tonnes	tonnes/ha	Million tonnes	tonnes/ha
Eastern and Southern Africa	13 248	44.8	1 302	4.4	11 700	39.6	26 250	88.7
Northern Africa	1 090	31.0	103	2.9	897	25.5	2 090	59.5
Western and Central Africa	36 229	118.5	1 522	5.0	14 795	48.4	52 546	171.9
Total Africa	**50 567**	**79.4**	**2 927**	**4.6**	**27 392**	**43.0**	**80 886**	**127.1**
East Asia	11 767	43.4	5 051	18.6	21 089	77.7	37 907	139.7
South and Southeast Asia	23 393	79.0	976	3.3	17 100	57.8	41 468	140.1
Western and Central Asia	2 388	43.2	399	7.2	2 571	46.5	5 358	97.0
Total Asia	**37 547**	**60.3**	**6 426**	**10.3**	**40 760**	**65.5**	**84 733**	**136.1**
Europe excl. Russian Federation	13 833	68.4	3 725	18.4	21 635	107.0	39 192	193.9
Total Europe	**54 574**	**53.6**	**17 191**	**16.9**	**100 677**	**98.9**	**172 442**	**169.5**
Caribbean	493	62.5	82	10.4	1 522	193.0	2 098	265.9
Central America	1 840	82.1	166	7.4	2 063	92.1	4 069	181.6
North America	39 301	54.4	30 953	42.8	69 697	96.5	139 951	193.7
Total North and Central America	**41 634**	**55.3**	**31 201**	**41.5**	**73 282**	**97.4**	**146 118**	**194.1**
Total Oceania	**13 881**	**74.9**	**3 247**	**17.5**	**15 935**	**86.0**	**33 063**	**178.5**
Total South America	**96 331**	**114.1**	**7 057**	**8.4**	**41 457**	**49.1**	**144 846**	**171.6**
WORLD	**294 535**	**72.6**	**68 049**	**16.8**	**299 504**	**73.8**	**662 088**	**163.1**

Carbon stock

STATUS

FRA 2020 received information on forest carbon stock in 2020 from 192 countries and territories (representing 99 percent of the world's forests) for biomass; 79 countries and territories (76 percent) for dead wood; 77 countries and territories (65 percent) for litter carbon; and 76 countries and territories (66 percent) for soil carbon. For non-reporting countries and territories, carbon stock was estimated by multiplying subregional averages for each of the carbon pools by forest area.

The total forest carbon stock (i.e. including all carbon pools) is estimated at 662 Gt (163 tonnes per ha), comprising 300 Gt in soil organic matter, 295 Gt in living biomass and 68.0 Gt in dead wood and litter (Table 42). Soil organic matter constitutes the biggest pool, with 45.2 percent of the total carbon, followed by above-ground biomass, below-ground biomass, litter and dead wood.

TRENDS

FRA 2020 received complete time-series data from 188 countries and territories (representing 95 percent of the total forest area) for forest biomass (above- and below-ground); 72 countries and territories (70 percent) for dead wood; 73 countries and territories (60 percent) for litter; and 72 countries (51 percent) for soil carbon.

For those countries and territories that did not report, carbon stocks were estimated by multiplying the subregional average stock per hectare by forest area (as estimated for each point in the time series).

The global forest carbon stock decreased between 1990 and 2020 (Figure 23), from 668 Gt to 662 Gt (Table 43), due to an overall decrease in forest area. There were considerable regional and subregional differences in the trend, however: for example, the carbon stock in forest biomass increased significantly in East Asia, Western and Central Asia, Europe and North America (where forest area increased) and decreased considerably in South America and Western and Central Africa (Figure 24, p. 53).

Although total forest carbon stocks decreased globally between 1990 and 2020, carbon stock per hectare increased for all pools (Figure 25, p. 53).

TABLE 43. **Total forest carbon stock, by region and subregion, 1990–2020**

Region/subregion	Forest carbon stock (million tonnes)			
	1990	2000	2010	2020
Eastern and Southern Africa	30 932	29 642	27 978	26 250
Northern Africa	2 338	2 242	2 190	2 090
Western and Central Africa	61 005	58 253	55 745	52 546
Total Africa	**94 274**	**90 137**	**85 913**	**80 886**
East Asia	27 110	30 261	33 908	37 907
South and Southeast Asia	45 804	43 792	43 071	41 468
Western and Central Asia	4 180	4 511	4 959	5 358
Total Asia	**77 093**	**78 564**	**81 938**	**84 733**
Europe excl. Russian Federation	31 625	34 260	36 833	39 192
Total Europe	**158 744**	**162 457**	**168 069**	**172 442**
Caribbean	1 552	1 783	1 977	2 098
Central America	4 988	4 617	4 270	4 069
North America	136 644	137 730	139 324	139 951
Total North and Central America	**143 184**	**144 131**	**145 572**	**146 118**
Total Oceania	**33 338**	**33 111**	**33 077**	**33 063**
Total South America	**161 765**	**154 917**	**147 917**	**144 846**
WORLD	**668 399**	**663 316**	**662 485**	**662 088**

FIGURE 23. Trends in total forest carbon stock, by carbon pool, 1990–2020

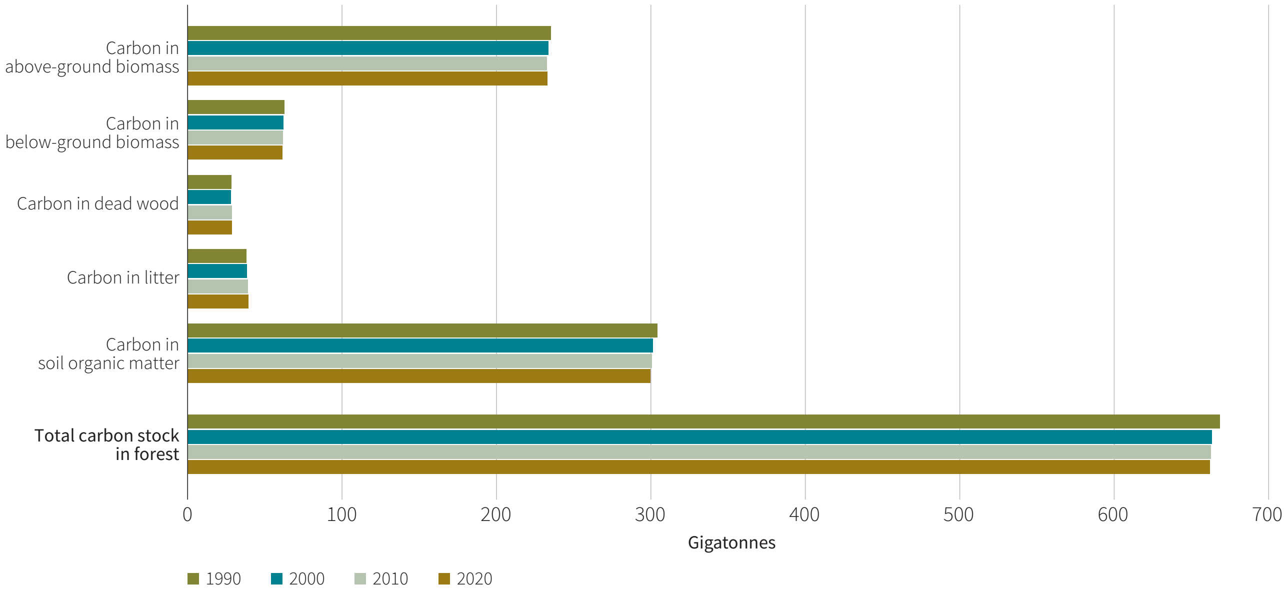


FIGURE 24. Change in forest biomass carbon stock, by region and subregion, 1990–2020

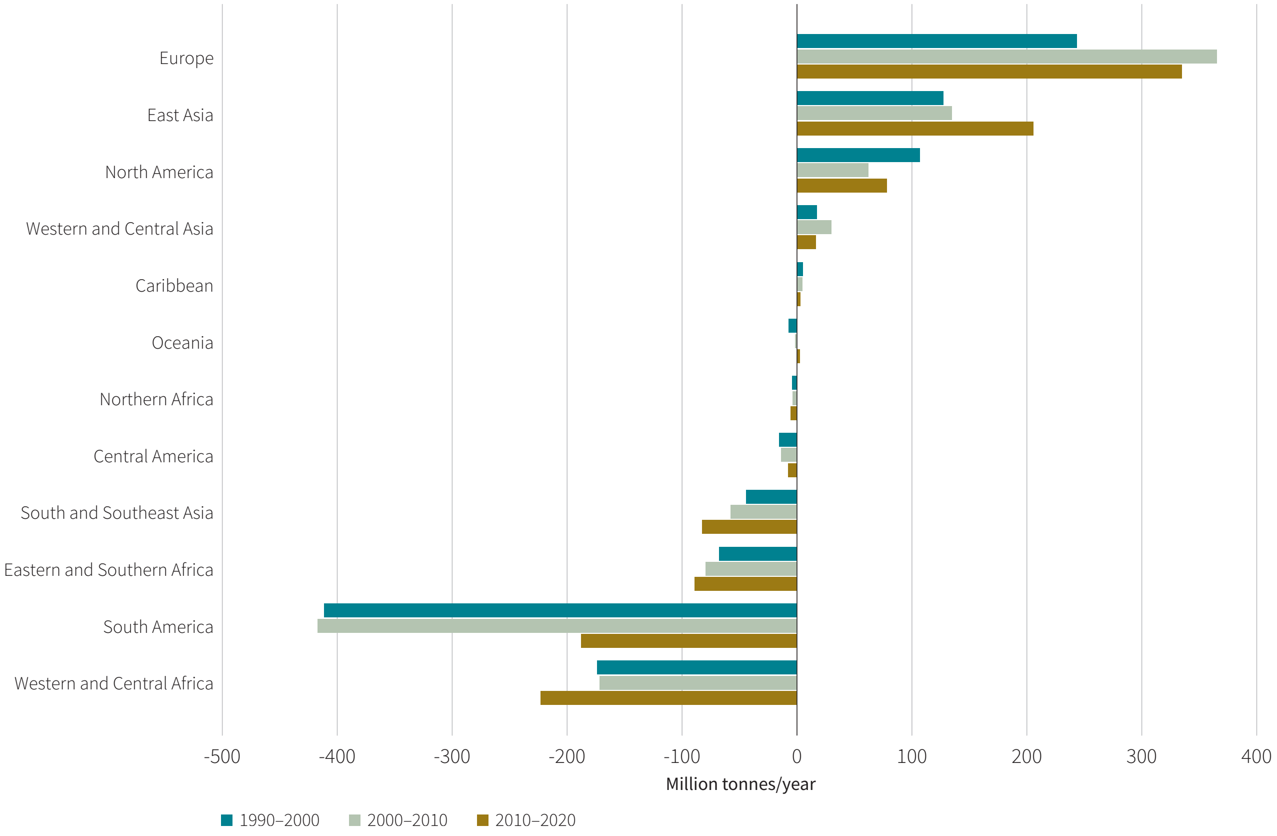
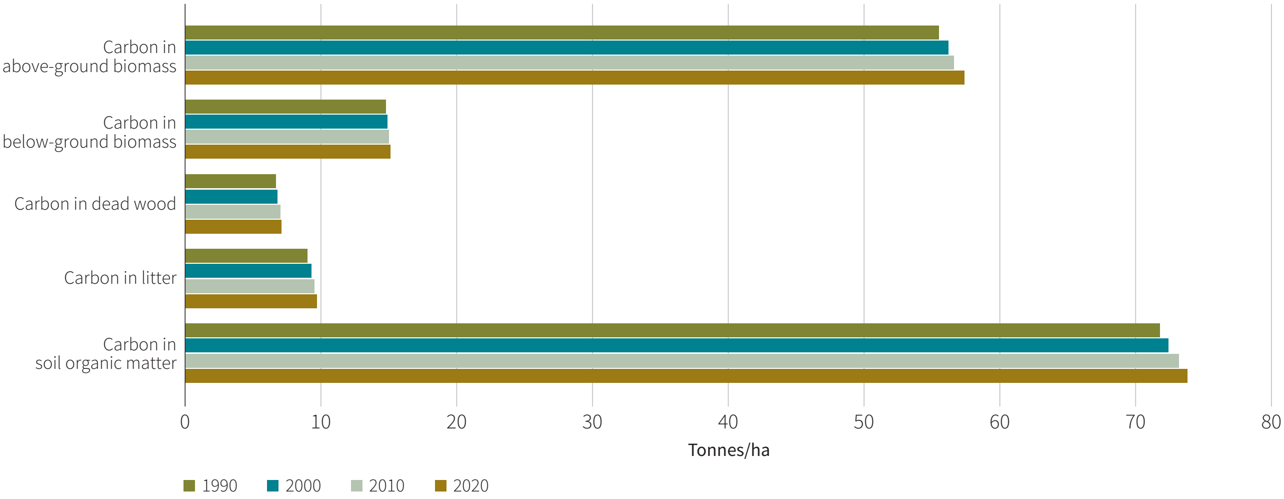


FIGURE 25. Forest carbon stock per hectare, by carbon pool, 1990–2020



5

Designation and management

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Countries were asked to report in FRA 2020 on the status of, and trends in, their forests according to the primary designated management objective – that is, the main intended purpose for which a forest is managed and used. To be considered "primary", the management objective must be significantly more important than other management objectives, and the forest area reported under a given primary management objective may not be reported under any other primary management objective. Note, however, that the primary management objective does not exclude provisions for other benefits or values. For example, sustainably managed natural production forests – for which the primary objective might be wood production – typically also contribute to the protection of soil and water, biodiversity conservation and the provision of social services. Similarly, forests managed primarily for the protection of soil and water might also contribute to wood production, biodiversity conservation and other management objectives.

Six broad management objectives were identified for FRA 2020:

1. ***Production*** – the management objective is the production of timber, fibre, bioenergy and/or non-wood forest products.
2. ***Protection of soil and water*** – the management objective is the protection of soil and water.
3. ***Conservation of biodiversity*** – the management objective is biodiversity conservation. This category includes but is not limited to areas designated for biodiversity conservation in protected areas.
4. ***Social services*** – the management objective is the provision of social services such as recreation, tourism, education, research and the conservation of cultural or spiritual sites.
5. ***Multiple use*** – the management objective is a combination of several purposes, none of which is significantly more important than another. Thus, a designation of multiple use indicates that the forest is managed for any combination of production, soil and water protection, biodiversity conservation and the provision of social services.
6. ***Other*** – the management objective is other than production, the protection of soil and water, biodiversity conservation, social services or multiple use.

In addition to the primary designated management objective, information was collected on the area of forest within protected areas and under long-term management plans.

The area and proportion of forests under formal protection is an indicator of how countries are addressing the need to conserve and protect forest ecosystems and the services those ecosystems provide. In FRA 2020, countries were requested to provide information on the area of forest in formally established protected areas corresponding to International Union for Conservation of Nature (IUCN) protected-area categories I–IV (IUCN, undated).

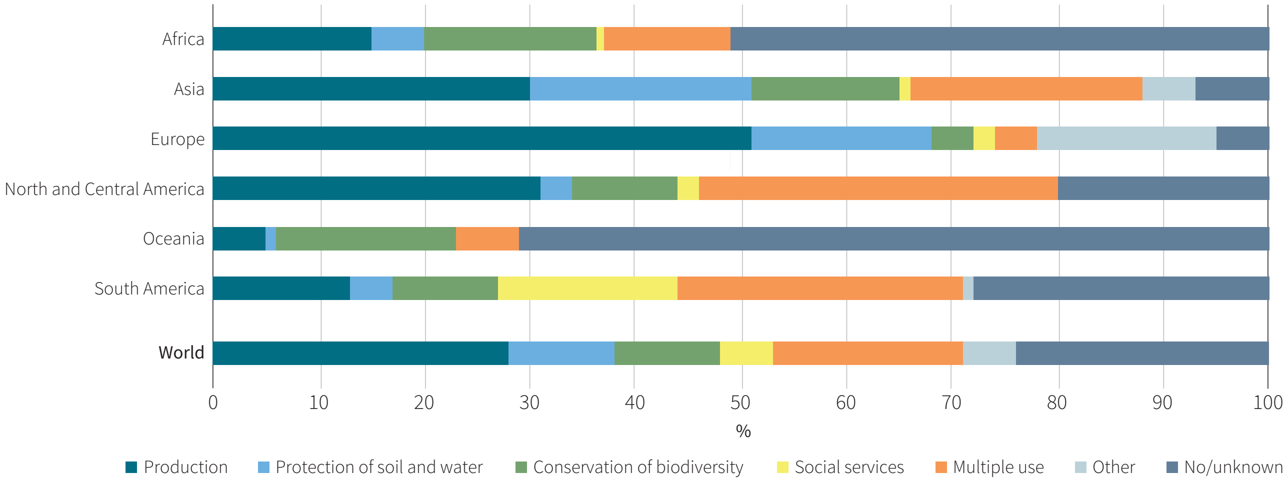
The area and proportion of forests with long-term management plans that are documented and periodically revised is an important indicator of the intention to sustainably manage forest resources. The area of forests in protected areas and the area of forests with long-term management plans are also components of SDG indicator 15.2.1 ("progress towards sustainable forest management"), which is reported annually by FAO to the United Nations Statistics Division.

Many countries provided FRA 2020 with data on the area of forest designated for productive purposes and, in some cases, on the area of forest designated for conservation purposes (albeit often using the proxy of forests in protected areas). Fewer countries provided information on the area of forest designated for social services, multiple use and other purposes.

Many countries have good information on the status of their protected areas and continuously monitor forests in these areas. Others, however, were only able to report information on the total area of protected areas and relied on estimates of the extent to which these are forested.

This chapter provides a global overview of the status of forest management designation in all 236 countries and territories covered by the assessment and an in-depth

FIGURE 26. Proportion of total forest area designated for various primary management objectives, by region and globally, 2020



analysis of the status of, and trends in, each designation category. Differences between the two analyses are due to differences in reporting for each designation category (i.e. reporting was not complete for all categories for all countries).

Global overview

An analysis of the primary designated management objectives of forests, inclusive of all 236 countries and areas covered by the assessment, shows that production is the main designated objective (accounting for 28 percent[19] of the world's total forest area), followed by multiple use (18 percent). Ten percent of the total forest area is designated primarily for biodiversity conservation and another 10 percent is designated primarily for the protection of soil and water. The provision of social services is the primary designated management objective for 5 percent of the world's forest area, and "other purposes", which includes areas of forest managed primarily for scientific research or military and defensive purposes, accounts for another 5 percent. The remaining 23 percent of the world's forest has no designation or the designation is unknown.

Figure 26 shows the global and regional distribution by designation category.

Of the regions, the largest share of forest area designated for production is in Europe, where more than half the forest area is designated for this purpose. If the Russian Federation is excluded, however, the proportion is about 30 percent of the forest area, which is similar to the proportion in North and Central America. North and Central America and South America have the largest shares of forest area designated for multiple use, and Asia has the largest share of forest area designated primarily for the protection of soil and water. In all regions, 10–17 percent of the total forest area is designated primarily for biodiversity conservation (if the Russian Federation is excluded from the estimate for Europe, which otherwise would be much lower, at about 4 percent).

Analysis by designation category

PRODUCTION

Status. FRA 2020 received information on the area of forest designated primarily for production in 2020 from 160 countries representing 93 percent of the world's forest area. Globally, the area of forest so designated is estimated at 1.15 billion ha, which is equivalent to 31 percent of the forest area of reporting countries (Table 44). This area is larger than any other designation category.

Europe has the largest area of forest designated for production, at 515 million ha (53 percent of the forest area of reporting countries). If the Russian Federation is excluded, an estimated 59.6 million ha (29 percent of the forest area) is designated for production in Europe.

The second-largest area of forest designated primarily for production is in North and Central America, estimated at 231 million ha (31 percent of the forest area), followed by Asia, at 190 million ha (32 percent of the forest area). Only

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[19] Note that the percentages given in this global overview may vary from those shown in tables 44, 47, 50, 53, 56 and 59 and in the key findings, which were calculated for reporting countries only. In this global overview, the percentages were calculated for the total world forest area, with non-reporting countries treated as having no or unknown designation.

TABLE 44. Forest area designated primarily for production, by region and subregion, 2020

Region/subregion	Data availability		Forest designated for production	
	No. of reporting countries	% of total forest area	Area (1 000 ha)	% of forest area
Eastern and Southern Africa	15	70	30 062	15
Northern Africa	5	77	1 579	6
Western and Central Africa	18	95	67 693	28
Total Africa	**38**	**82**	**99 333**	**19**
East Asia	4	98	73 980	28
South and Southeast Asia	14	98	105 231	36
Western and Central Asia	14	84	10 614	23
Total Asia	**32**	**97**	**189 825**	**32**
Europe excl. Russian Federation	37	76	59 603	29
Total Europe	**38**	**95**	**514 895**	**53**
Caribbean	15	59	1 149	25
Central America	2	29	3 226	50
North America	5	100	226 643	31
Total North and Central America	**22**	**97**	**231 017**	**31**
Total Oceania	**18**	**99**	**10 051**	**5**
Total South America	**12**	**90**	**106 348**	**14**
WORLD	**160**	**93**	**1 151 470**	**31**

5 percent of the forest area in Oceania is designated primarily for production.

Three countries – Albania, Denmark and Montenegro – reported that 80 percent or more of their forest area is designated primarily for production. Nine of the top ten countries with the highest share of forest area designated primarily for production are in Europe (Table 45). Thirty-nine countries reported that they have no forest area designated for production.

Trends. The analysis of trends in the area of forest designated primarily for production encompasses 151 countries representing 89 percent of the total forest area.

The area of forest designated primarily for production decreased slightly (by 1.33 million ha) between 1990 and 2020, although there were fluctuations over the period (Table 46). The area of forest area so designated decreased at a rate of 2.32 million ha per year in 1990–2000 and 1.55 million ha per year in 2000–2010, before increasing by 3.74 million ha per year in 2010–2020. The shift to an increasing trend was driven mainly by Europe and especially the Russian Federation, which reported an annual increase in the area of forest designated primarily for production of 3.38 million ha in 2010–2020. Overall in Europe, however, the relative share of forest designated primarily for production decreased from 54 percent in 1990 to 53 percent in 2020 (Figure 27). The proportion of the total forest area designated primarily for production increased steadily in North and Central America between 1990 and 2020, from 31 percent to 35 percent.

In Africa, the area of forest designated primarily for production decreased in absolute terms between 1990 and 2020, from 109 million ha to 91.4 million ha, but the proportion of the total forest area so designated was steady

TABLE 45. Top ten countries for share of forest area designated primarily for production, 2020

Ranking	Country	Forest designated for production	
		Area (1 000 ha)	% of total forest area
1	Montenegro	675	82
2	Denmark	504	80
3	Albania	628	80
4	Latvia	2 603	76
5	Ghana	5 908	74
6	Czechia	1 975	74
7	Estonia	1 776	73
8	Lithuania	1 577	72
9	Sweden	19 587	70
10	Croatia	1 334	69

TABLE 46. **Forest area designated primarily for production, and annual change, by region and subregion, 1990–2020**

Region/subregion	Data availability		Forest area designated for production (1 000 ha)				Annual change (1 000 ha/yr)		
	No. of reporting countries	% of total forest area	1990	2000	2010	2020	1990–2000	2000–2010	2010–2020
Eastern and Southern Africa	15	70	39 501	37 908	36 306	30 062	-159	-160	-624
Northern Africa	5	77	1 520	1 506	1 520	1 579	-1	1	6
Western and Central Africa	16	87	68 051	64 746	53 072	59 803	-330	-1 167	673
Total Africa	**36**	**79**	**109 072**	**104 160**	**90 899**	**91 443**	**-491**	**-1 326**	**54**
East Asia	4	98	83 936	83 347	67 314	73 980	-59	-1 603	667
South and Southeast Asia	14	98	109 326	113 918	110 835	105 231	459	-308	-560
Western and Central Asia	14	84	9 191	9 828	10 143	10 614	64	31	47
Total Asia	**32**	**97**	**202 453**	**207 093**	**188 292**	**189 825**	**464**	**-1 880**	**153**
Europe excl. Russian Federation	35	76	63 657	61 936	60 738	58 927	-172	-120	-181
Total Europe	**36**	**95**	**510 335**	**473 373**	**482 229**	**514 219**	**-3 696**	**886**	**3 199**
Caribbean	15	59	875	866	1 051	1 149	-1	18	10
Central America	1	15	4 352	3 672	2 848	2 317	-68	-82	-53
North America	4	91	202 172	212 796	220 848	226 302	1 062	805	545
Total North and Central America	**20**	**88**	**207 398**	**217 334**	**224 746**	**229 768**	**994**	**741**	**502**
Total Oceania	**16**	**98**	**8 035**	**8 721**	**9 293**	**9 205**	**69**	**57**	**-9**
Total South America	**11**	**83**	**98 533**	**101 977**	**101 666**	**100 033**	**344**	**-31**	**-163**
WORLD	**151**	**89**	**1 135 826**	**1 112 657**	**1 097 126**	**1 134 493**	**-2 317**	**-1 553**	**3 737**

FIGURE 27. Proportion of total forest area designated primarily for production, by region, 1990–2020

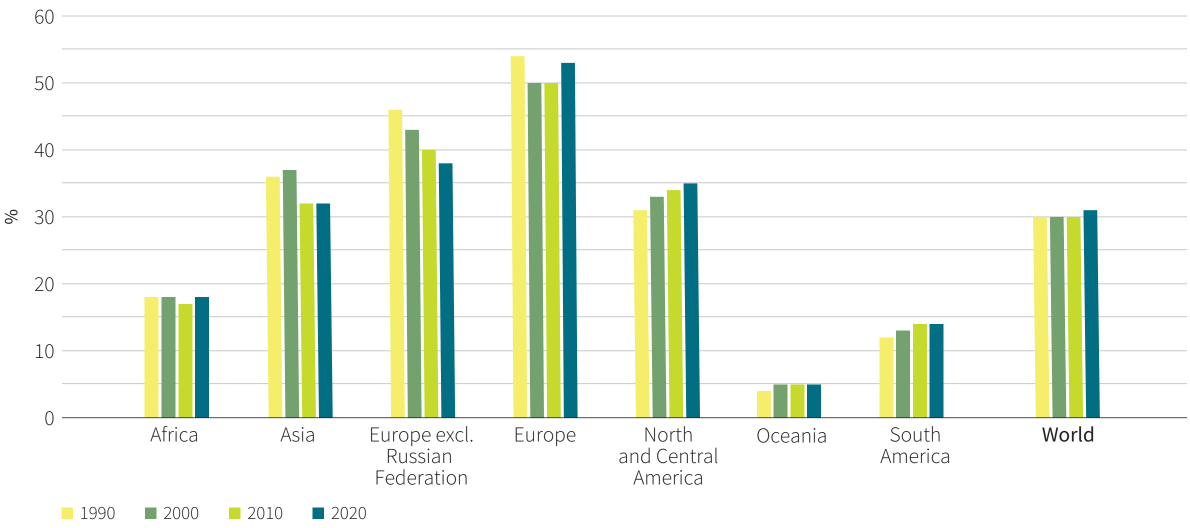


TABLE 47. **Forest area designated primarily for multiple use, by region and subregion, 2020**

Region/subregion	Data availability		Forest area designated for multiple use	
	No. of reporting countries	% of total forest area	Area (1 000 ha)	% of forest area
Eastern and Southern Africa	11	40	37 059	31
Northern Africa	3	19	4 298	64
Western and Central Africa	14	77	32 808	14
Total Africa	**28**	**57**	**74 164**	**21**
East Asia	4	98	78 536	30
South and Southeast Asia	14	98	46 819	16
Western and Central Asia	14	84	8 380	18
Total Asia	**32**	**97**	**133 734**	**22**
Europe excl. Russian Federation	31	71	42 360	30
Total Europe	**32**	**94**	**45 923**	**5**
Caribbean	11	55	282	7
Central America	2	29	825	13
North America	5	100	253 531	35
Total North and Central America	**18**	**97**	**254 638**	**35**
Total Oceania	**15**	**99**	**13 467**	**7**
Total South America	**9**	**74**	**226 681**	**36**
WORLD	**134**	**85**	**748 606**	**22**

at 18 percent. Thus, the trend of decreasing area was driven mainly by a decrease in forest area rather than by changes in management designation.

In Asia, the area of forest designated primarily for production decreased from 202 million ha in 1990 to 190 million ha in 2020. The proportion of the total forest area designated for production also declined, from 36 percent in 1990 to 32 percent in 2020.

There were slight increases in the area of forest designated primarily for production in South America and Oceania between 1990 and 2020, as well as in the proportion of the total forest area so designated – from 12 percent to 14 percent in South America and from 4 percent to 5 percent in Oceania.

MULTIPLE USE

Status. FRA 2020 received information on the area of forest designated primarily for multiple use in 2020 from 134 countries and territories representing 85 percent of the world's forest area. The area so designated is estimated at 749 million ha, which is 22 percent of the total forest area of the reporting countries and territories (Table 47).

The largest area of forest designated for multiple use is in North and Central America, at 255 million ha (35 percent of the region's total forest area), followed by South America, at 227 million ha (36 percent).

TABLE 48. **Countries and territories with 100 percent of their total forest area designated primarily for multiple use, 2020**

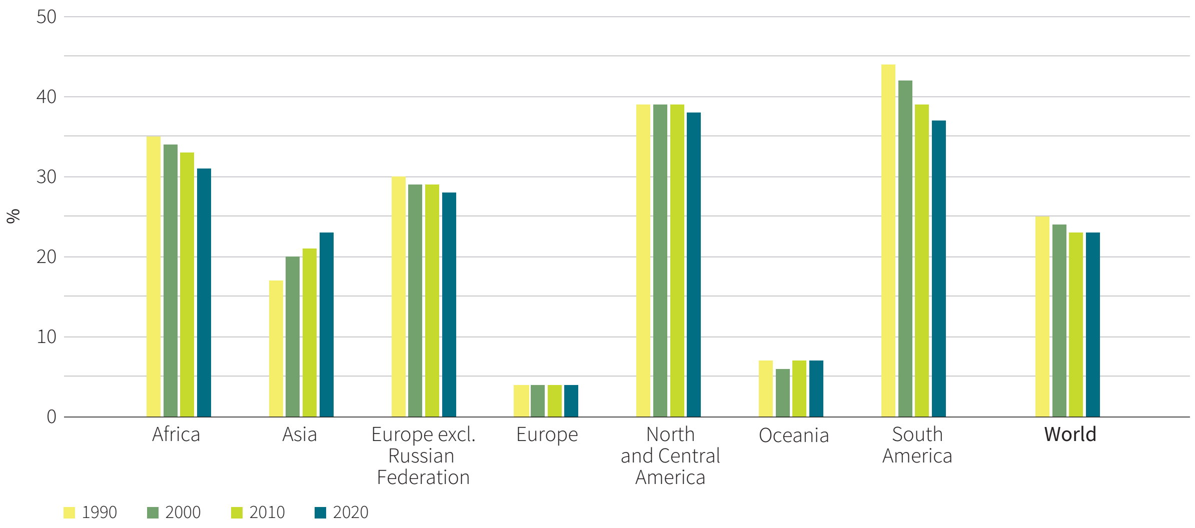
Country/territory	Forest area designated for multiple use (1 000 ha)
France	17 253
Botswana	15 255
French Guyana	8 003
Saudi Arabia	977
Syrian Arab Republic	522
United Arab Emirates	317
Réunion	98.4
Guadeloupe	71.9
Micronesia (Federated States of)	64.4
Martinique	52.3
Palau	41.4
Mayotte	13.9
Saint Kitts and Nevis	11.0
Marshall Islands	9.40
Djibouti	5.80
Isle of Man	3.46
Montserrat	2.50
Saint Pierre and Miquelon	1.22
Faroe Islands	0.08

TABLE 49. Area of forest designated primarily for multiple use, and annual change, by region and subregion, 1990–2020

Region/subregion	Data availability		Forest area designated primarily for multiple use (1 000 ha)				Annual change (1 000 ha/yr)		
	No. of reporting countries	% of total forest area	1990	2000	2010	2020	1990–2000	2000–2010	2010–2020
Eastern and Southern Africa	11	40	45 576	42 735	40 692	37 059	-284	-204	-363
Northern Africa	3	19	4 995	4 844	4 456	4 298	-15	-39	-16
Western and Central Africa	12	35	44 265	40 200	36 831	31 665	-406	-337	-517
Total Africa	**26**	**37**	**94 835**	**87 779**	**81 980**	**73 021**	**-706**	**-580**	**-896**
East Asia	3	93	46 438	57 148	68 300	78 536	1 071	1 115	1 024
South and Southeast Asia	14	98	43 615	46 130	44 116	46 819	251	-201	270
Western and Central Asia	14	84	4 789	5 476	8 017	8 380	69	254	36
Total Asia	**31**	**94**	**94 843**	**108 755**	**120 433**	**133 734**	**1 391**	**1 168**	**1 330**
Europe excl. Russian Federation	29	68	37 638	37 951	**39 020**	**39 136**	**31**	**107**	**12**
Total Europe	**30**	**94**	**37 746**	**38 105**	**40 724**	**42 699**	**36**	**262**	**198**
Caribbean	11	55	302	291	284	282	-1	-1	n.s.
Central America	1	15	0	0	0	0	0	0	0
North America	4	91	260 124	259 652	257 496	253 435	-47	-216	-406
Total North and Central America	**16**	**88**	**260 426**	**259 942**	**257 780**	**253 717**	**-48**	**-216**	**-406**
Total Oceania	**13**	**97**	**12 677**	**10 451**	**11 887**	**11 846**	**-223**	**144**	**-4**
Total South America	**8**	**71**	**308 654**	**275 426**	**237 925**	**223 446**	**-3 323**	**-3 750**	**-1 448**
WORLD	**124**	**79**	**809 181**	**780 458**	**750 728**	**738 464**	**-2 872**	**-2 973**	**-1 226**

Note: n.s. = not significant.

FIGURE 28. Proportion of total forest area designated primarily for multiple use, by region, 1990–2020



Thirty-one countries and territories reported that more than 50 percent of their total forest area is designated primarily for multiple use, of which 19 indicated that 100 percent of their forests is so designated (Table 48, p. 61).

Trends. FRA 2020 received time-series data on the area of forest designated for multiple use from 124 countries representing 79 percent of the total forest area. The area of forest so designated decreased by 70.7 million ha between 1990 and 2020, with the rate of decrease slowing in the most recent decade (Table 49). The average annual rate of decrease was 2.87 million ha in 1990–2000, 2.97 million ha in 2000–2010 and 1.23 million ha in 2010–2020.

The area of forest designated for multiple use declined between 1990 and 2020 in all regions except Asia and Europe. In Asia, the area of forest so designated increased after 1990, including as a proportion of the total forest area (from 17 percent to 23 percent) (Figure 28). The increase was due largely to China, where the area of forest designated primarily for multiple use increased from 45.8 million ha in 1990 to 78.0 million ha in 2020. The area of forest so designated increased in Europe between 1990 and 2020, but there was little change in the proportion (at about 4 percent). If the Russian Federation is excluded, however, the proportion of the total forest area designated primarily for multiple use in Europe decreased from 33 percent in 1990 to 31 percent in 2020.

PROTECTION OF SOIL AND WATER

Status. FRA 2020 received information on the area of forest designated primarily for the protection of soil and water in 2020 from 141 countries and territories representing 82 percent of the world's forest area. The area of forest so designated is estimated at 398 million ha, which is 12 percent of the total forest area of the reporting countries and territories (Table 50).

Europe has the largest area of forest designated primarily for soil and water protection, at 171 million ha (18 percent of the region's total forest area), followed by Asia, at 132 million ha (22 percent – the largest proportion of any region).

TABLE 50. Forest area designated primarily for soil and water protection, by region and subregion, 2020

Region/subregion	Data availability		Forest designated for the protection of soil and water	
	No. of reporting countries	% of total forest area	Area (1 000 ha)	% of forest area
Eastern and Southern Africa	14	79	26 630	11
Northern Africa	4	25	1 689	19
Western and Central Africa	13	31	7 519	8
Total Africa	**31**	**53**	**35 838**	**11**
East Asia	4	98	56 542	21
South and Southeast Asia	13	96	54 769	19
Western and Central Asia	13	84	21 141	46
Total Asia	**30**	**96**	**132 452**	**22**
Europe excl. Russian Federation	35	71	21 595	15
Total Europe	**36**	**94**	**170 959**	**18**
Caribbean	11	55	1 567	36
Central America	2	29	68	1
North America	5	100	18 793	3
Total North and Central America	**18**	**97**	**20 429**	**3**
Total Oceania	**17**	**27**	**1 217**	**2**
Total South America	**9**	**78**	**37 380**	**6**
WORLD	**141**	**82**	**398 274**	**12**

TABLE 51. Top ten countries and territories for the proportion of total forest area designated primarily for soil and water protection, 2020

Ranking	Country/territory	Forest designated for the protection of soil and water	
		Area (1 000 ha)	% of total forest area
1	Kiribati	1.2	100
2	Kuwait	6.3	100
3	Cabo Verde	44.7	98
4	Kyrgyzstan	1 212	92
5	Tunisia	627	89
6	Wallis and Futuna Islands	5.1	87
7	Bahrain	0.6	86
8	Uzbekistan	2 532	69
9	Mongolia	9 192	65
10	Kazakhstan	2 160	63

The proportion of the total forest area designated primarily for soil and water protection is higher than 90 percent in four countries – Kiribati and Kuwait (both 100 percent), Cabo Verde (98 percent) and Kyrgyzstan (92 percent) (Table 51). Fifty-one countries and territories reported no forest designated primarily for soil and water protection (eight of which have no forest area).

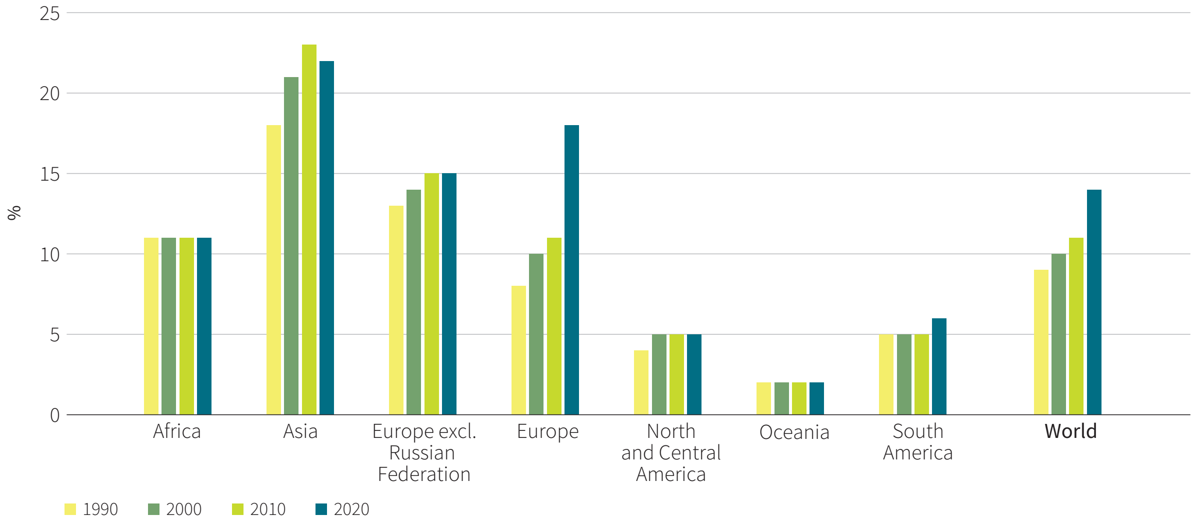
Trends. FRA 2020 received time-series data on the area of forest designated primarily for soil and water protection from 131 countries and territories representing 71 percent of the total forest area. The area of forest so designated increased by 119 million ha between 1990 and 2020 (Table 52). The average annual rate of increase grew over

TABLE 52. Area of forest area designated primarily for soil and water protection, and annual change, by region and subregion, 1990–2020

Region/subregion	Data availability		Forest area designated for the protection of soil and water (1 000 ha)				Annual change (1 000 ha/yr)		
	No. of reporting countries	% of total forest area	1990	2000	2010	2020	1990–2000	2000–2010	2010–2020
Eastern and Southern Africa	14	79	29 228	28 738	27 181	26 630	-49	-156	-55
Northern Africa	4	25	1 536	1 553	1 527	1 689	2	-3	16
Western and Central Africa	11	29	12 220	10 961	9 298	7 474	-126	-166	-182
Total Africa	**29**	**52**	**42 984**	**41 252**	**38 005**	**35 793**	**-173**	**-325**	**-221**
East Asia	4	98	29 016	40 317	58 363	56 542	1 130	1 805	-182
South and Southeast Asia	13	96	51 462	53 810	54 017	54 769	235	21	75
Western and Central Asia	13	83	22 069	22 478	21 655	21 129	41	-82	-53
Total Asia	**30**	**96**	**102 547**	**116 606**	**134 035**	**132 440**	**1 406**	**1 743**	**-160**
Europe excl. Russian Federation	33	71	16 916	19 656	**20 687**	**21 482**	**274**	**103**	**80**
Total Europe	**34**	**94**	**75 612**	**90 044**	**105 798**	**170 846**	**1 443**	**1 575**	**6 505**
Caribbean	11	55	884	1 124	1 467	1 567	24	34	10
Central America	1	15	128	108	84	68	-2	-2	-2
North America	3	48	15 039	15 188	15 165	15 115	15	-2	-5
Total North and Central America	**15**	**47**	**16 051**	**16 420**	**16 716**	**16 751**	**37**	**30**	**3**
Total Oceania	**15**	**26**	**1 165**	**1 163**	**1 161**	**1 152**	n.s	n.s	**-1**
Total South America	**8**	**71**	**33 169**	**30 639**	**29 660**	**33 505**	**-253**	**-98**	**384**
WORLD	**131**	**71**	**271 528**	**296 124**	**325 376**	**390 487**	**2 460**	**2 925**	**6 511**

Note: n.s. = not significant.

FIGURE 29. Proportion of total forest area designated primarily for the protection of soil and water, by region, 1990–2020



the period, especially in the most recent decade, from 2.46 million ha in 1990–2000, to 2.93 million ha in 2000–2010, to 6.51 million ha in 2010–2020. The steep increase in the ten years to 2020 was due mainly to the Russian Federation, where the average annual increase in the area designated primarily for soil and water protection grew from 1.47 million ha in 2000–2010 to 6.43 million ha in 2010–2020.

All regions except Africa and Oceania reported increases in the area of forest designated primarily for soil and water protection between 1990 and 2020. The proportion of the total forest area so designated was steady over the period in both Africa (at 11 percent) and Oceania (at 2 percent) (Figure 29).

CONSERVATION OF BIODIVERSITY

Status. FRA 2020 received information on the area of forest designated primarily for biodiversity conservation in 2020 from 165 countries representing 91 percent of the world's forest area. The area so designated is estimated at 424 million ha, which is 11 percent of the forest area of the reporting countries (Table 53).

The largest area of forest designated for biodiversity conservation is in Africa, at 107 million ha; this is 24 percent of the forest area, which is also the highest proportion among the regions. The lowest proportion is in Europe, at 4 percent, although this increases to 12 percent if the Russian Federation is excluded.

Three countries and territories – Saint-Martin (French part), Thailand and Tonga – reported that more than 80 percent of their forest area is designated primarily for biodiversity conservation (Table 54).

Trends. FRA 2020 received time-series data on the area of forest designated primarily for biodiversity conservation from 161 countries and territories representing 91 percent of the total forest area. The area of forest so designated increased by 111 million ha between 1990 and 2020, with the largest increase occurring between 2000 and 2010 (Table 55, p. 67). The rate of average annual increase grew from 3.60 million ha in 1990–2000 to 5.13 million ha in 2000–2010, but it dropped by more than half in 2010–2020, to 2.34 million ha. The global trend was evident in all regions except Europe and South America, where the rate of increase decreased in each successive decade between 1990 and 2020.

The biggest increase in the area of forest designated primarily for biodiversity conservation between 1990 and 2020 was in North and Central America, at 27.4 million ha, followed by Asia, at 26.1 million ha, and Europe, at 20.6 million ha.

The biggest increases between 1990 and 2020 in the proportion of total forest area designated primarily for biodiversity conservation were in Africa, from 18 percent to 24 percent, and Oceania, from 11 percent to 17 percent (Figure 30, p. 67).

SOCIAL SERVICES

Status. FRA 2020 received information on the area of forest designated primarily for social services in 2020 from 132 countries and territories representing 77 percent of the world's forest area. The total area so designated is estimated at 186 million ha – 6 percent of the forest area of the reporting countries (Table 56, p. 68).

TABLE 53. Forest area designated primarily for biodiversity conservation, by region and subregion, 2020

Region/subregion	Data availability		Forest designated for biodiversity conservation	
	No. of reporting countries	% of total forest area	Area (1 000 ha)	% of forest area
Eastern and Southern Africa	14	47	38 192	27
Northern Africa	5	77	7 810	29
Western and Central Africa	21	90	60 583	22
Total Africa	**40**	**69**	**106 585**	**24**
East Asia	4	98	16 547	6
South and Southeast Asia	15	98	69 091	24
Western and Central Asia	16	94	3 653	7
Total Asia	**35**	**98**	**89 292**	**15**
Europe excl. Russian Federation	36	87	20 337	12
Total Europe	**37**	**97**	**38 919**	**4**
Caribbean	17	59	855	18
Central America	2	29	2 324	36
North America	5	100	71 760	10
Total North and Central America	**24**	**97**	**74 939**	**10**
Total Oceania	**17**	**98**	**30 752**	**17**
Total South America	**12**	**90**	**83 883**	**11**
WORLD	**165**	**91**	**424 370**	**11**

TABLE 54. Top ten countries and territories for the proportion of total forest area designated primarily for biodiversity conservation, 2020

Ranking	Country/territory	Forest designated for biodiversity conservation	
		Area (1 000 ha)	% of forest area
1	Thailand	19 873	82
2	Tonga	8.95	82
3	Saint-Martin (French part)	1.24	81
4	Norfolk Island	0.49	76
5	Sao Tome and Principe	51.9	57
6	Guinea-Bissau	1 980	57
7	Cameroon	20 340	56
8	Zambia	44 814	54
9	New Zealand	9 893	53
10	Guinea	6 189	49

TABLE 55. Area of forest designated primarily for biodiversity conservation, and annual change, by region and subregion, 1990–2020

Region/subregion	Data availability		Forest area designated for biodiversity conservation (1 000 ha)				Annual change (1 000 ha/yr)		
	No. of reporting countries	% of total forest area	1990	2000	2010	2020	1990–2000	2000–2010	2010–2020
Eastern and Southern Africa	14	47	33 334	34 857	35 398	38 192	152	54	279
Northern Africa	5	77	4 931	4 945	7 515	7 810	1	257	30
Western and Central Africa	20	90	56 853	57 676	60 714	60 583	82	304	-13
Total Africa	**39**	**69**	**95 119**	**97 478**	**103 627**	**106 585**	**236**	**615**	**296**
East Asia	4	98	4 481	6 238	11 697	16 547	176	546	485
South and Southeast Asia	15	98	57 669	59 140	66 149	69 091	147	701	294
Western and Central Asia	16	94	1 043	1 472	2 691	3 653	43	122	96
Total Asia	**35**	**98**	**63 193**	**66 850**	**80 537**	**89 292**	**366**	**1 369**	**875**
Europe excl. Russian Federation	36	87	6 525	11 999	17 492	20 337	547	549	284
Total Europe	**37**	**97**	**18 340**	**28 189**	**35 064**	**38 919**	**985**	**688**	**385**
Caribbean	16	59	626	677	738	855	5	6	12
Central America	1	15	1 920	1 620	1 256	1 022	-30	-36	-23
North America	5	100	43 686	50 544	66 541	71 760	686	1 600	522
Total North and Central America	**22**	**97**	**46 231**	**52 841**	**68 535**	**73 637**	**661**	**1 569**	**510**
Total Oceania	**17**	**98**	**20 472**	**23 973**	**28 981**	**30 752**	**350**	**501**	**177**
Total South America	**11**	**86**	**68 011**	**78 045**	**81 897**	**82 901**	**1 003**	**385**	**100**
WORLD	**161**	**91**	**311 366**	**347 375**	**398 642**	**422 086**	**3 601**	**5 127**	**2 344**

FIGURE 30. Proportion of total forest area designated primarily for biodiversity conservation, by region, 1990–2020

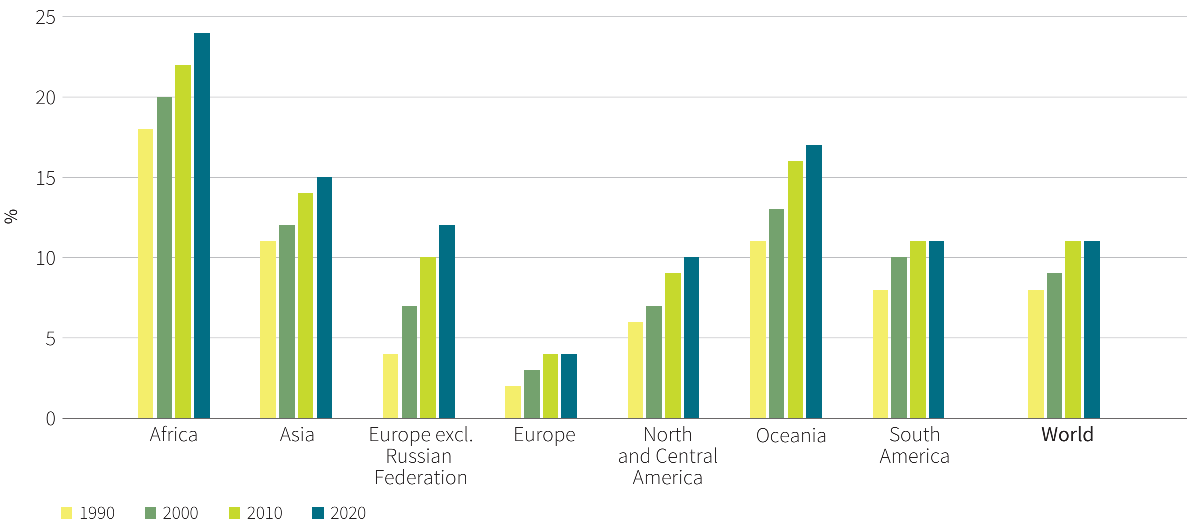


TABLE 56. Forest area designated primarily for social services, by region and subregion, 2020

Region/subregion	Data availability		Forest designated for social services	
	No. of reporting countries	% of total forest area	Area (1 000 ha)	% of forest area
Eastern and Southern Africa	11	27	1 551	2
Northern Africa	4	25	165	2
Western and Central Africa	11	29	1 286	1
Total Africa	**26**	**28**	**3 002**	**2**
East Asia	4	98	3 591	1
South and Southeast Asia	14	98	203	n.s.
Western and Central Asia	13	65	1 864	5
Total Asia	**31**	**95**	**5 658**	**1**
Europe excl. Russian Federation	34	82	5 269	3
Total Europe	**35**	**96**	**18 874**	**2**
Caribbean	11	55	23	1
Central America	2	29	0	0
North America	5	100	18 001	2
Total North and Central America	**18**	**97**	**18 024**	**2**
Total Oceania	**13**	**7**	**54**	n.s.
Total South America	**9**	**74**	**140 023**	**22**
WORLD	**132**	**77**	**185 634**	**6**

Note: n.s. = not significant.

TABLE 57. Top ten countries for the proportion of total forest area designated primarily for social services, 2020

Ranking	Country	Forest designated primarily for social services	
		% of total forest area	% of forest area
1	Singapore	12.2	78
2	Brazil	139 394	28
3	Republic of Moldova	76	20
4	Ukraine	1 450	15
5	Belarus	1 290	15
6	Brunei Darussalam	50.8	13
7	Senegal	1 044	13
8	Iceland	6.67	13
9	Georgia	348	12
10	Poland	1 021	11

South America has both the largest absolute area of forest designated primarily for social services, at 140 million ha, and the largest proportion of total forest area so designated, at 22 percent. This area is composed almost entirely of forests reported by Brazil for the protection of the culture and way of life of forest-dependent people, at 139 million ha (almost one-third of that country's total forest area).

More than 10 percent of the total forest area is designated primarily for social services in ten countries and territories, led by Singapore at 78 percent, Brazil at 28 percent and the Republic of Moldova at 20 percent (Table 57). Seventy-eight countries and territories (of which eight have no forest) reported no area designated primarily for social services.

Trends. FRA 2020 received time-series data on the area of forest designated primarily for social services from 122 countries and territories representing 66 percent of the total forest area. The area so designated decreased by 6.06 million ha between 1990 and 2020, although there was a slight increase (of 186 000 ha per year) in the most recent decade (Table 58).

The area of forest designated primarily for social services declined in Europe and South America between 1990 and 2020 and increased slightly in the other regions.

TABLE 58. Area of forest designated primarily for social services, and annual change, by region and subregion, 1990–2020

Region/subregion	Data availability		Forest area designated for social services (1 000 ha)				Annual change (1 000 ha/yr)		
	No. of reporting countries	% of total forest area	1990	2000	2010	2020	1990–2000	2000–2010	2010–2020
Eastern and Southern Africa	11	27	19	20	21	1551	n.s.	n.s.	153
Northern Africa	4	25	3	2	165	165	n.s.	16	n.s.
Western and Central Africa	10	29	1 960	1 740	1 552	1286	-22	-19	-27
Total Africa	**25**	**28**	**1 983**	**1 762**	**1 738**	**3002**	**-22**	**-2**	**126**
East Asia	4	98	1 078	1 583	2 679	3591	51	110	91
South and Southeast Asia	12	91	175	188	200	200	1	1	n.s.
Western and Central Asia	13	64	2 399	1 737	1 784	1861	-66	5	8
Total Asia	**29**	**92**	**3 652**	**3 509**	**4 663**	**5652**	**-14**	**115**	**99**
Europe excl. Russian Federation	33	82	6 169	6 023	5 673	5 267	-15	-35	-41
Total Europe	**34**	**96**	**23 545**	**17 356**	**18 041**	**18 872**	**-619**	**69**	**83**
Caribbean	11	55	5	5	23	23	0	2	0
Central America	1	15	0	0	0	0	0	0	0
North America	3	48	14 643	14 694	14 682	14 700	5	-1	2
Total North and Central America	**15**	**47**	**14 648**	**14 699**	**14 705**	**14 723**	**5**	**1**	**2**
Total Oceania	**11**	**5**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total South America	**8**	**71**	**144 499**	**143 143**	**141 259**	**140 019**	**-136**	**-188**	**-124**
WORLD	**122**	**66**	**188 327**	**180 468**	**180 405**	**182 269**	**-786**	**-6**	**186**

Note: n.s. = not significant.

Nevertheless, the proportion of the total forest area so designated increased in South America over the period (from 21 percent to 23 percent) and was relatively steady in the other regions (Figure 31).

OTHER MANAGEMENT OBJECTIVES

Status. FRA 2020 received information on the area of forest designated primarily for other purposes (most commonly forest managed primarily for scientific research or for military and defensive purposes) in 2020 from 122 countries and territories representing 72 percent of the world's forest area. Worldwide, the area of forest so designated is estimated at 218 million ha (7 percent of the forest area of reporting countries) (Table 59).

Of the regions, the largest area of forest designated primarily for other purposes is in Europe, at 178 million ha (18 percent of the total forest area). This forest is almost entirely in the Russian Federation, where 175 million ha is designated primarily for other uses, including "remote forests", which are forests designated to remain untouched for 20 or more years.

Trends. FRA 2020 received time-series data on the area of forest designated primarily for other purposes from 112 countries and territories representing 68 percent of the total forest area. The area of forest so designated decreased by 112 million ha between 1990 and 2020, due mostly to Europe and especially the Russian Federation, where the area declined by 99.4 million ha over the period (Figure 32, p. 71).

FOREST IN PROTECTED AREAS

Status. FRA 2020 received information on the area of forest in protected areas in 2020 from 173 countries and territories accounting for 97 percent of the global forest area. The total area of forest in legally protected areas is estimated at 726 million ha (18 percent of the total forest area in reporting countries and territories) (Table 60, p. 71).

FIGURE 31. Proportion of total forest area designated primarily for social services, by region, 1990–2020

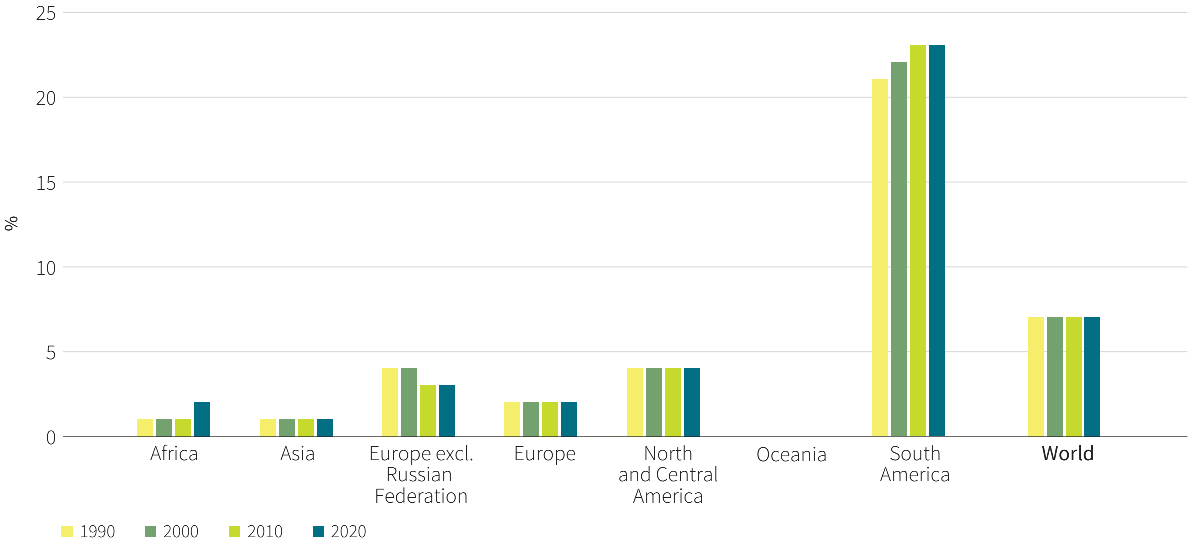


TABLE 59. **Forest area designated primarily for other management objectives, by region and subregion, 2020**

Region/subregion	Data availability		Forest designated for other management objectives	
	No. of reporting countries	% of total forest area	Area (1 000 ha)	% of forest area
Eastern and Southern Africa	9	21	0	0
Northern Africa	3	19	0	0
Western and Central Africa	10	27	0	0
Total Africa	**22**	**24**	**0**	**0**
East Asia	4	98	27 509	10
South and Southeast Asia	13	98	956	n.s.
Western and Central Asia	11	64	173	n.s.
Total Asia	**28**	**95**	**28 638**	**5**
Europe excl. Russian Federation	34	80	2 699	2
Total Europe	**32**	**96**	**177 604**	**18**
Caribbean	11	55	0	0
Central America	2	29	0	0
North America	3	48	945	n.s.
Total North and Central America	**16**	**48**	**945**	**n.s.**
Total Oceania	**14**	**79**	**67**	**n.s.**
Total South America	**10**	**81**	**10 609**	**2**
WORLD	**122**	**72**	**217 864**	**7**

Note: n.s. = not significant.

FIGURE 32. Proportion of total forest area designated primarily for other management objectives, by region, 1990–2020

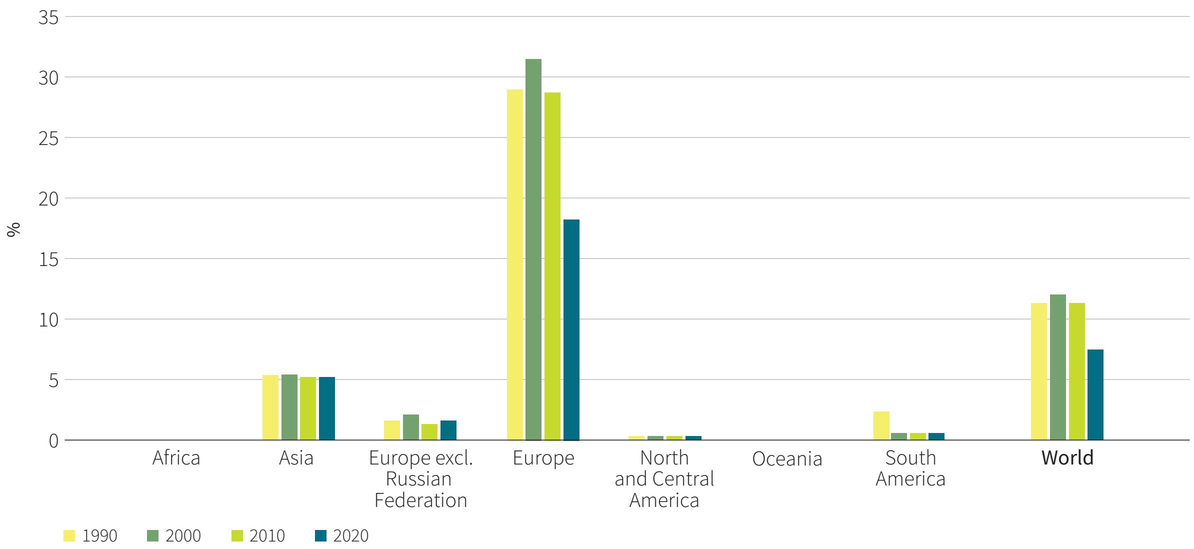


TABLE 60. **Forest in protected areas, by region and subregion, 2020**

Region/subregion	Data availability		Forest in protected areas	
	No. of reporting countries	% of total forest area	Area (1 000 ha)	% of forest area
Eastern and Southern Africa	19	91	91 251	34
Northern Africa	5	77	5 214	19
Western and Central Africa	24	98	61 365	21
Total Africa	**48**	**94**	**157 829**	**27**
East Asia	4	98	38 233	14
South and Southeast Asia	14	92	91 495	34
Western and Central Asia	13	87	14 469	30
Total Asia	**31**	**94**	**144 197**	**25**
Europe excl. Russian Federation	40	96	39 198	20
Total Europe	**41**	**99**	**57 780**	**6**
Caribbean	18	66	984	19
Central America	7	100	9 336	42
North America	5	100	69 267	10
Total North and Central America	**30**	**100**	**79 587**	**11**
Total Oceania	**10**	**98**	**29 120**	**16**
Total South America	**13**	**98**	**257 293**	**31**
WORLD	**173**	**97**	**725 807**	**18**

TABLE 61. Top ten countries for forest in protected areas, 2020

Ranking	Country	Forest in protected areas		
		Area (1 000 ha)	Share of global total (%)	Cumulative %
1	Brazil	149 577	21	21
2	Indonesia	51 770	7	28
3	Venezuela (Bolivarian Republic of)	45 605	6	34
4	Zambia	31 831	4	38
5	United States of America	31 735	4	43
6	China	30 350	4	47
7	Canada	29 507	4	51
8	United Republic of Tanzania	28 508	4	55
9	Democratic Republic of the Congo	24 297	3	58
10	Australia	24 072	3	62

TABLE 62. Forest in protected areas, and annual change, by region and subregion, 1990–2020

Region/subregion	Data availability		Forest in protected areas (1 000 ha)				Annual change (1 000 ha)		
	No. of reporting countries	% of total forest area	1990	2000	2010	2020	1990–2000	2000–2010	2010–2020
Eastern and Southern Africa	15	89	85 171	85 671	86 705	89 452	49.9	103	275
Northern Africa	5	77	3 477	3 491	5 211	5 214	1.4	172	0.3
Western and Central Africa	21	55	35 794	35 811	37 517	36 771	1.7	171	-74.5
Total Africa	**41**	**72**	**124 442**	**124 973**	**129 433**	**131 437**	**53.0**	**446**	**200**
East Asia	3	89	4 900	19 159	30 300	33 761	1 426	1 114	346
South and Southeast Asia	13	86	71 200	73 474	86 245	88 233	227	1 277	199
Western and Central Asia	10	65	8 507	9 778	11 320	12 925	127	154	160
Total Asia	**26**	**85**	**84 607**	**102 411**	**127 865**	**134 919**	**1 780**	**2 545**	**705**
Europe excl. Russian Federation	26	69	6 494	12 440	22 944	27 388	595	1 050	444
Total Europe	**27**	**94**	**18 309**	**28 631**	**40 516**	**45 970**	**1 032**	**1 189**	**545**
Caribbean	16	59	582	653	837	917	7.1	18.4	8.0
Central America	2	31	4 977	4 304	3 577	3 184	-67.3	-72.8	-39.2
North America	5	100	36 922	46 194	66 463	69 267	927	2 027	280
Total North and Central America	**23**	**98**	**42 482**	**51 151**	**70 877**	**73 368**	**867**	**1 973**	**249**
Total Oceania	**8**	**78**	**17 734**	**21 106**	**26 022**	**27 741**	**337**	**492**	**172**
Total South America	**8**	**80**	**150 247**	**171 581**	**206 132**	**215 703**	**2 133**	**3 455**	**957**
WORLD	**133**	**86**	**437 821**	**499 853**	**600 845**	**629 139**	**6 203**	**10 099**	**2 829**

The proportion of forest in protected areas is more than 30 percent in South America, where particularly Brazil, Peru and Venezuela (Bolivarian Republic of) have large areas of protected forests; 11 percent in North and Central America; and 6 percent in Europe. The relatively low proportion of forest in protected areas in Europe is influenced heavily by the Russian Federation, which reported that 2.3 percent of its forest area is protected; if the Russian Federation is excluded, the figure for Europe rises to about 20 percent.

The ten countries with the largest areas of formally protected forest account for about 60 percent of all forests in protected areas worldwide (Table 61). Fifteen countries reported that more than 50 percent of their forest area is under formal protection.

Trends. FRA 2020 received time-series data on the area of forest in protected areas from 133 countries and territories accounting for 86 percent of the global forest area. This area increased between 1990 and 2020, although the average annual rate of increase slowed from 10.1 million ha in 2000–2010 to 2.83 million ha in 2010–2020 (Table 62). In their reports, some countries mentioned reductions in protected-forest area, due mainly to illegal activities and encroachment for agriculture.

FOREST AREA WITH LONG-TERM MANAGEMENT PLANS

Status. FRA 2020 received information on the area of forest subject to long-term management plans in 2020 from 135 countries and territories representing 94 percent of the global forest area. More than 2 billion ha of forest is subject to management plans in those countries and territories (about 54 percent of their total forest area), with considerable differences between regions (Table 63).

TABLE 63. Area of forest with long-term management plans, by region and subregion, 2020

Region/subregion	Data availability		Forest with management plans	
	No. of reporting countries	% of total forest area	Area (1 000 ha)	% of forest area
Eastern and Southern Africa	14	80	59 156	25
Northern Africa	5	77	9 202	34
Western and Central Africa	17	91	61 853	22
Total Africa	**36**	**85**	**130 211**	**24**
East Asia	4	98	195 586	74
South and Southeast Asia	9	83	123 983	51
Western and Central Asia	11	84	33 915	73
Total Asia	**24**	**89**	**353 484**	**64**
Europe excl. Russian Federation	36	82	128 591	77
Total Europe	**37**	**96**	**943 836**	**96**
Caribbean	8	51	2 759	68
Central America	4	47	1 133	11
North America	5	100	428 803	59
Total North and Central America	**17**	**98**	**432 695**	59
Total Oceania	**9**	**97**	**55 713**	**31**
Total South America	**12**	**95**	**133 879**	**17**
WORLD	**135**	**94**	**2 049 817**	**54**

TABLE 64. Forest area with long-term management plans, and annual change, by region and subregion, 2000–2020

Region/subregion	Data availability		Forest area with management plans (1 000 ha)			Annual change (1 000 ha/yr)	
	No. of reporting countries	% of total forest area	2000	2010	2020	2000–2010	2010–2020
Eastern and Southern Africa	12	80	41 149	44 651	59 151	350	1 450
Northern Africa	4	71	5 234	7 851	8 938	262	109
Western and Central Africa	12	47	32 971	38 707	49 551	574	1 084
Total Africa	**28**	**64**	**79 354**	**91 210**	**117 639**	**1 186**	**2 643**
East Asia	4	98	140 231	162 691	195 586	2 246	3 289
South and Southeast Asia	9	83	112 875	120 986	123 983	811	300
Western and Central Asia	8	77	27 292	30 502	33 403	321	290
Total Asia	**21**	**89**	**280 397**	**314 178**	**352 973**	**3 378**	**3 879**
Europe excl. Russian Federation	31	80	124 767	122 417	127 091	-235	467
Total Europe	**32**	**96**	**934 036**	**937 552**	**942 337**	**352**	**478**
Caribbean	8	51	1 471	1 972	2 759	50	79
Central America	2	31	26	19	23	-1	n.s.
North America	5	100	385 531	399 391	428 803	1 386	2 941
Total North and Central America	**15**	**97**	**387 029**	**401 382**	**431 585**	**1 435**	**3 020**
Total Oceania	**8**	**25**	**12 044**	**12 458**	**12 453**	**41**	**-1**
Total South America	**12**	**95**	**64 970**	**98 758**	**133 879**	**3 379**	**3 512**
WORLD	**116**	**87**	**1 757 831**	**1 855 538**	**1 990 865**	**9 771**	**13 533**

Note: n.s. = not significant.

Almost half the total area is in Europe and particularly the Russian Federation. Less than 25 percent of the forest area in Africa and South America is under management plans.

Trends. The availability of information on the area of forest under management plans is improving, but many countries lack data for 1990. Therefore, the analysis of trends presented here is based on information for 2000–2020 provided by 116 countries and territories representing 87 percent of the world's forest area. According to these data, the area of forest subject to management plans increased by 233 million ha between 2000 and 2020 (Table 64).

Box 6. Forest certification

The concept of independently certifying the quality of forest management was developed in the 1990s as a voluntary tool for promoting sustainable forest management and the trade of products originating in sustainably managed forests. Two major international certification schemes prevail today: the Forest Stewardship Council (FSC) and the Programme for the Endorsement of Forest Certification (PEFC); the latter scheme endorses national forest certification schemes that demonstrate compliance with its globally established sustainability benchmarks.

The forest area under independently verified forest management certification is a subindicator of Sustainable Development Goal indicator 15.2.1 ("progress towards sustainable forest management"). FAO reports on this subindicator annually based on data provided by the secretariats of the FSC and the PEFC. As part of this process, the two secretariats have undertaken a joint analysis of areas certified under both schemes, thereby making it possible to estimate the total certified forest area without bias due to double certification.

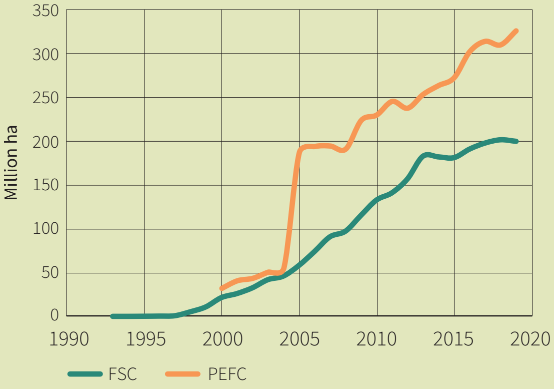
FSC certification started in 1993 in Costa Rica and the United States of America; it gained momentum in the late 1990s, and the area of FSC certification has increased

(Continued)

steadily since. The first PEFC certification occurred in Austria, Finland, Germany, Norway and Sweden in 2000, increased slowly in Europe for a few years, and almost quadrupled in 2005 with the endorsement of two North American certification schemes (those of the Sustainable Forestry Initiative and the Canadian Standards Association) (Figure 33).

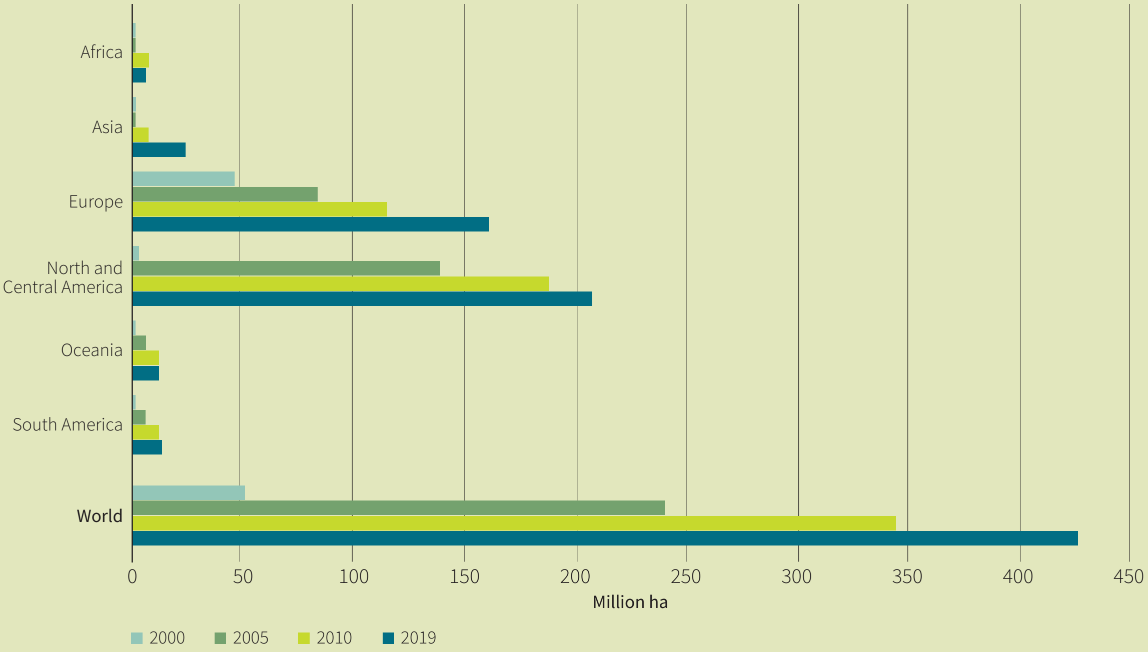
A total of 200 million ha of forest was certified under the FSC in 2019 and 319 million ha was certified under the PEFC. Of these areas, 93 million ha was certified under both systems; thus, the total net certified forest area in 2019 was 426 million ha. Figure 34 shows that the majority of the certified area was in Europe and North America. Canada had by far the most, at 167 million ha, followed by the Russian Federation (54.1 million ha) and the United States of America (38.1 million ha). These three countries together accounted for more than 60 percent of the world's certified forest area in 2019.

Figure 33. Forest area certified under the Forest Stewardship Council and the Programme for the Endorsement of Forest Certification, 1990–2019



Note: FSC = Forest Stewardship Council; PEFC = Programme for the Endorsement of Forest Certification.

Figure 34. Total area of certified forest after adjustment for double certification, by region, 2000–2019



6

Ownership and management rights

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Information on the ownership of, and management rights to, forests is crucial for governments in formulating effective forest policies. Clear and secure forest ownership and management rights are important for encouraging public and private investment in forests and for alleviating the poverty of people who depend directly or indirectly on forests for their livelihoods.

FRA 2020 collected information on ownership and management rights for 1990, 2000, 2010 and 2015; 2015, therefore, is the reference year for status analysis.

Three main forest ownership categories were assessed: 1) public ownership; 2) private ownership; and 3) unknown/other.

Three subcategories were specified for private ownership: 1) forest owned by individuals; 2) forest owned by business entities or institutions; and 3) forest owned by local, tribal or indigenous communities.

FRA 2020 also collected information on who holds management rights in public forests, defined as the right to manage and use publicly owned forests for a specified period. Five main categories of management rights holders were identified: 1) public administrations; 2) individuals; 3) private business entities and institutions; 4) local, tribal and indigenous communities; and 5) unknown/other.

Forest ownership

STATUS

FRA 2020 received information on forest ownership in 2015 for the main categories (i.e. public, private and unknown/other) from 180 countries and territories representing 97 percent of the world's forests. Figure 35 shows the proportion of the total forest area in these three categories in 2015.

Public ownership was predominant in 2015 in all regions and subregions except Central America, where private ownership accounted for 51 percent of the forest area (Table 65). The largest share of public ownership was in Europe, where it accounted for 90 percent – although if the Russian Federation is excluded, the share decreases to 46 percent.

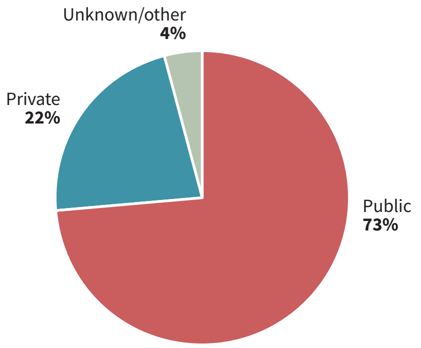
The largest share of public ownership at the subregional level was in Western and Central Asia, at 99 percent. The regions with the largest shares of privately owned forests were Oceania, at 47 percent, and North and Central America, at 36 percent.

In Europe, private forest accounted for 9 percent of the forest area; if the Russian Federation is excluded, the share increases to 52 percent.

Seventy-three countries reported that more than 90 percent of their forests was publicly owned in 2015. The share was 100 percent in 48 of those countries, of which 23 were in Asia (mostly Western and Central Asia) and 16 were in Africa (mostly Western and Central Africa).

Public ownership was below 10 percent in 15 countries; five countries and territories, all in Oceania, reported that 100 percent of their forest area was owned privately (and therefore no forest was publicly owned). Table 66 shows the top ten countries and territories for the proportion of forest area under private ownership in 2015.

FIGURE 35. Proportion of total forest area, by three ownership categories, 2015



Note: "Other" applies mainly to forest areas with disputed ownership or with ownership in transition, and to forest areas in which there are discrepancies between national forest inventory datasets and public registers.

TABLE 65. Forest ownership, by region and subregion, 2015

Region/subregion	Data availability		Forest area (1 000 ha)			% of forest area		
	No. of reporting countries	% of total forest area	Private	Public	Unknown/ other	Private	Public	Unknown/ other
Eastern and Southern Africa	17	92	22 634	161 327	98 017	8	57	35
Northern Africa	5	77	7 492	20 328	66	27	73	n.s.
Western and Central Africa	21	96	5 881	281 155	16 229	2	93	5
Total Africa	**43**	**93**	**36 007**	**462 810**	**114 312**	**6**	**75**	**19**
East Asia	5	100	105 815	156 074	0	40	60	0
South and Southeast Asia	17	100	26 688	264 512	7 883	9	88	3
Western and Central Asia	21	99	760	52 675	0	1	99	0
Total Asia	**43**	**100**	**133 263**	**473 262**	**7 883**	**22**	**77**	**1**
Europe excl. Russian Federation	41	87	92 056	80 519	2 943	52	46	2
Total Europe	**42**	**97**	**92 056**	**895 449**	**2 943**	**9**	**90**	n.s.
Caribbean	14	72	996	4 535	81	18	81	1
Central America	3	32	3 668	2 675	802	51	37	11
North America	5	100	261 163	449 605	12 775	36	62	2
Total North and Central America	**22**	**98**	**265 827**	**456 815**	**13 658**	**36**	**62**	**2**
Total Oceania	**17**	**100**	**86 986**	**96 241**	**1 051**	**47**	**52**	**1**
Total South America	**13**	**98**	**273 581**	**527 702**	**37 806**	**33**	**63**	**5**
WORLD	**180**	**97**	**887 721**	**2 912 280**	**177 653**	**22**	**73**	**4**

Note: n.s. = not significant.

TABLE 66. Top ten countries and territories for the proportion of privately owned forest, 2015

Ranking	Country/territory	Forest under private ownership	
		Area (1 000 ha)	% of total forest area
1	American Samoa	17	100
2	Marshall Islands	9	100
3	Niue	19	100
4	Papua New Guinea	35 974	100
5	Vanuatu	442	100
6	Uruguay	1 906	99
7	Portugal	3 215	97
8	Yemen	522	95
9	El Salvador	548	90
10	Samoa	148	90

TRENDS

FRA 2020 received information on trends in forest ownership from 166 countries and territories representing 95 percent of the world's forest.

The area of forest under public ownership decreased by 116 million ha between 1990 and 2015 and the area of privately owned forest increased by 29 million ha (Table 67). The proportion of the total forest area that is privately owned increased from 21 percent to 22 percent over the period, and the share of publicly owned forests decreased from 74 percent to 73 percent.

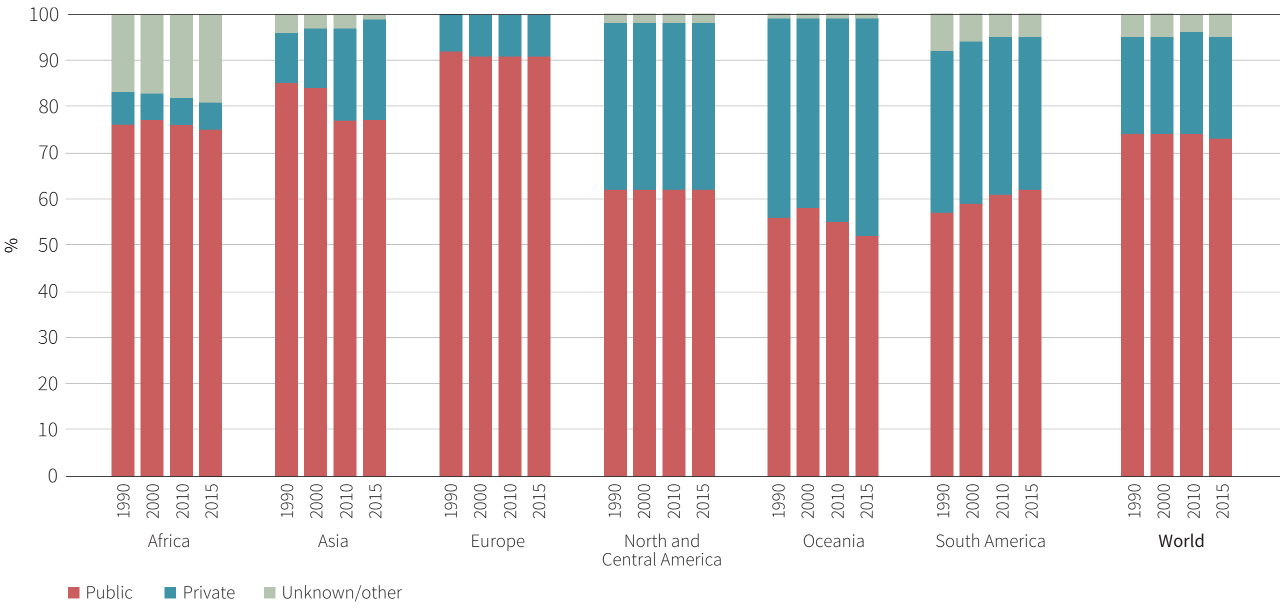
Asia had the highest gain in the area of private forest between 1990 and 2015, at about 69 million ha. This mainly reflects the trend in East Asia, where China reported an increase of just over 53 million ha of private forest since 1990. The share of private forest increased in China from 17 percent in 1990 to 41 percent in 2015.

The biggest decrease in the area of privately owned forest between 1990 and 2015 was in South America, where it declined by about 53 million ha, due mainly to a reduction of 85 million ha in Brazil. The proportion of privately owned forest in Brazil decreased from 47 percent of the total forest area in 1990 to 44 percent in 2015.

TABLE 67. Forest ownership, by region and subregion, 1990–2015

Region/subregion	Data availability		Forest ownership (1 000 ha)					
	No. of reporting countries	% of total forest area	Private		Public		Unknown/other	
			1990	2015	1990	2015	1990	2015
Eastern and Southern Africa	16	92	25 860	22 630	180 525	161 318	112 076	98 016
Northern Africa	5	77	7 153	7 492	24 629	20 328	61	66
Western and Central Africa	21	96	13 017	5 881	320 427	281 155	9 304	16 229
Total Africa	**42**	**93**	**46 029**	**36 002**	**525 580**	**462 801**	**121 441**	**114 312**
East Asia	5	100	46 809	105 815	163 098	156 074	0	0
South and Southeast Asia	15	96	16 474	26 029	279 164	255 277	19 251	7 883
Western and Central Asia	20	98	598	631	47 627	52 639	0	0
Total Asia	**40**	**98**	**63 882**	**132 475**	**489 889**	**463 991**	**19 250**	**7 883**
Europe excl. Russian Federation	39	87	74 443	91 614	84 961	80 045	2 214	2 943
Total Europe	**40**	**97**	**74 443**	**91 614**	**893 911**	**894 976**	**2 214**	2 943
Caribbean	14	72	752	996	3 404	4 535	137	81
Central America	1	16	2 244	1 717	1 741	1 351	796	518
North America	5	100	261 085	261 163	444 909	449 605	15 323	12 775
Total North and Central America	**20**	**97**	**264 081**	**263 876**	**450 054**	**455 491**	**16 257**	**13 373**
Total Oceania	**13**	**98**	**77 539**	**84 340**	**102 707**	**95 351**	**1 022**	**1 043**
Total South America	**11**	**87**	**301 571**	**248 280**	**488 356**	**462 213**	**66 499**	**37 806**
WORLD	**166**	**95**	**827 546**	**856 588**	**2 950 498**	**2 834 823**	**226 683**	**177 359**

FIGURE 36. Proportion of total forest area, by ownership type and region, 1990–2015



There were substantial declines in the area of both publicly owned and privately owned forests in Africa between 1990 and 2015. This apparently reflected losses in the total forest area rather than trends in ownership categories, with the share of the total forest area of each staying relatively steady over the period (Figure 36).

There was an increase in the proportion of the forest area owned privately in Oceania between 1990 and 2015, from 43 percent to 47 percent. Correspondingly, the proportion of forest owned publicly declined from 57 percent to 53 percent.

In Europe (excluding the Russian Federation, where all forests were 100 percent publicly owned in 2015), private ownership has become the region's predominant form of ownership, increasing in proportion from 46 percent of the total forest area in 1990 to 52 percent in 2015.

The proportion of the total forest area in private and public ownership in North and Central America was steady between 1990 and 2015, at 36 percent and 62 percent, respectively.

Private ownership, by type of owner

STATUS

FRA 2020 received information on the forest area owned by different types of private owner in 2015 from 115 countries and territories representing 50 percent of the world's forest area. Given the low coverage, the analysis presented here provides only a partial picture of this parameter at the global and regional levels.

Of the total area of privately owned forest in reporting countries and territories in 2015, individuals accounted for 51 percent, local, tribal and indigenous communities for 29 percent and business entities and institutions for 20 percent (Table 68).

Ownership by individuals was the predominant private-ownership type in Europe (78 percent of the total forest area owned privately) and North and Central America (55 percent). In Africa, in contrast, local, tribal and indigenous communities accounted for 85 percent of the total privately owned forest area. Insufficient data were available to derive findings for the other regions. It is worth mentioning, however, that three countries and territories in Oceania – American Samoa, Niue and Vanuatu – reported that 100 percent of their forest area was owned privately; the share owned by local, tribal and indigenous communities amounted to 100 percent in Niue and Vanuatu and 99 percent in American Samoa.

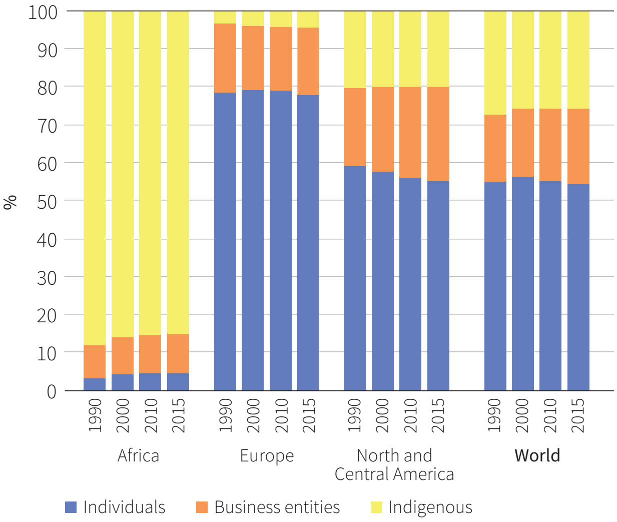
TRENDS

FRA 2020 received complete time-series data on the area of forest in the three types of private ownership from 109 countries and territories representing 50 percent of the world's forest. For these countries and territories, the share of forest area by private-ownership category was reasonably stable over the period. Globally, the proportion of privately owned forest declined between 1990 and 2015, from 55 percent to 54 percent for individuals and from 27 percent to 26 percent for local, tribal and indigenous communities, but it increased over the period for business entities and institutions, from 18 percent to 20 percent (Figure 37).

TABLE 68. Area of forest in three types of private ownership, by region, 2015

Region	Data availability		Forest ownership (1 000 ha)					
	No. of reporting countries	% of total forest area	Individuals		Business entities and institutions		Local, tribal and indigenous communities	
			1 000 ha	%	1 000 ha	%	1 000 ha	%
Africa	32	71	824	4	1 978	11	15 599	85
Asia	31	29	7 196	56	1 742	14	3 900	30
Europe	28	92	50 946	78	11 691	18	2 535	4
North and Central America	12	51	129 468	55	59 723	25	45 579	19
Oceania	9	21	160	0	0	0	37 551	100
South America	3	8	0	0	144	4	3 491	96
WORLD	**115**	**50**	**188 592**	**51**	**75 279**	**20**	**108 655**	**29**

FIGURE 37. Proportion of total private forest area, by ownership type and region, 1990–2015



The situation in North and Central America mirrored the global trend. In Africa, the proportion of the private forest area held by individuals increased from 3 percent in 1990 to 4 percent in 2015, and the proportion owned by business entities and institutions increased from 9 percent to 11 percent. Ownership by local, indigenous and tribal communities decreased from 88 percent to 85 percent over the period.

In Europe, the share of privately owned forest area decreased between 1990 and 2015, from 79 percent to 78 percent for individuals and from 19 percent to 18 percent for business entities and institutions, but it increased for local, tribal and indigenous communities, from 3 percent to 4 percent.

Insufficient data were available to derive findings for the other regions.

Holders of management rights in publicly owned forests

STATUS

FRA 2020 received information on the holders of management rights in public forests in 2015 from 147 countries and territories accounting for 85 percent of the total forest area.

Globally, public administrations held 83 percent of management rights in publicly owned forests in 2015, business entities and institutions held 13 percent, and local, tribal and indigenous communities held 2 percent (Table 69). The share of public forest managed by individuals was only 0.1 percent, and the identity of the holders of management rights was unknown or "other" for the remaining 1.7 percent. Public administrations were the predominant rights holders in all regions (Figure 38); they were especially larger holders in South America and Europe, where they accounted for 97 percent and 72 percent of the public forest area, respectively.

Business entities and institutions held management rights in 27 percent of the publicly owned forest area in Europe in 2015, the highest proportion of any of the regions. Management rights were more commonly held by local, tribal and indigenous communities than by business

TABLE 69. Holders of management rights to public forests, by region, 2015

Region	Data availability		Management rights (1 000 ha)									
	No. of reporting countries	% of total forest area	Public administration		Individuals		Business entities		Indigenous		Unknown/other	
			1 000 ha	%	1 000 ha	%	1 000 ha	%	1 000 ha	%	1 000 ha	%
Africa	37	81	378 849	88	0	0	41 485	10	7 104	1.7	844	n.s.
Asia	33	87	323 232	82	45	n.s.	1 275	n.s.	30 245	7.7	40 052	10
Europe	35	95	641 273	72	1	n.s.	244 003	27	1324	0.1	809	n.s.
North and Central America	17	88	389 302	86	202	n.s.	54 882	12	5 570	1.2	2 956	1
Oceania	15	28	6 728	96	0	0	278	4	0	0.0	0	0
South America	10	84	435 192	97	2 014	n.s.	5 925	1	7 173	1.6	3	n.s.
WORLD	**147**	**85**	**2 174 576**	**83**	**2 263**	n.s.	**347 848**	**13**	**51 416**	**2.0**	**44 664**	**2**

Note: n.s. = not significant.

FIGURE 38. Proportion of total publicly owned forest area, by holder of management rights and region, 2015

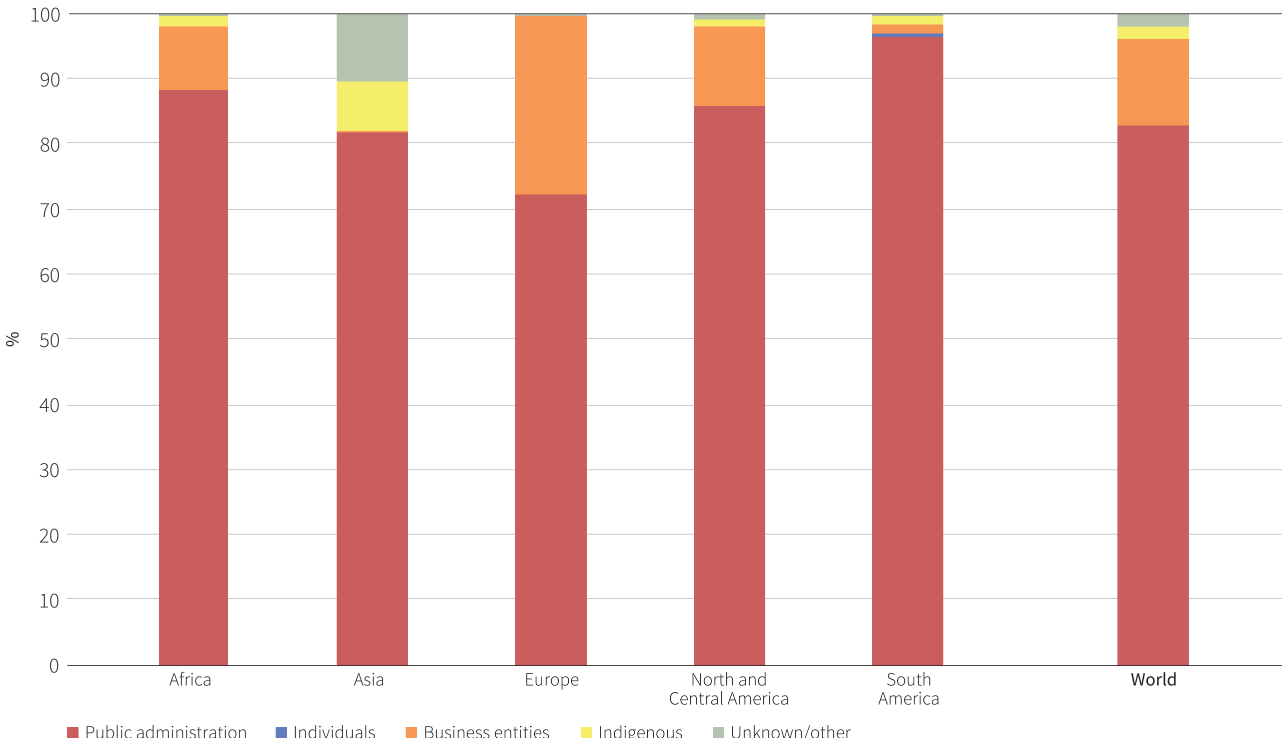
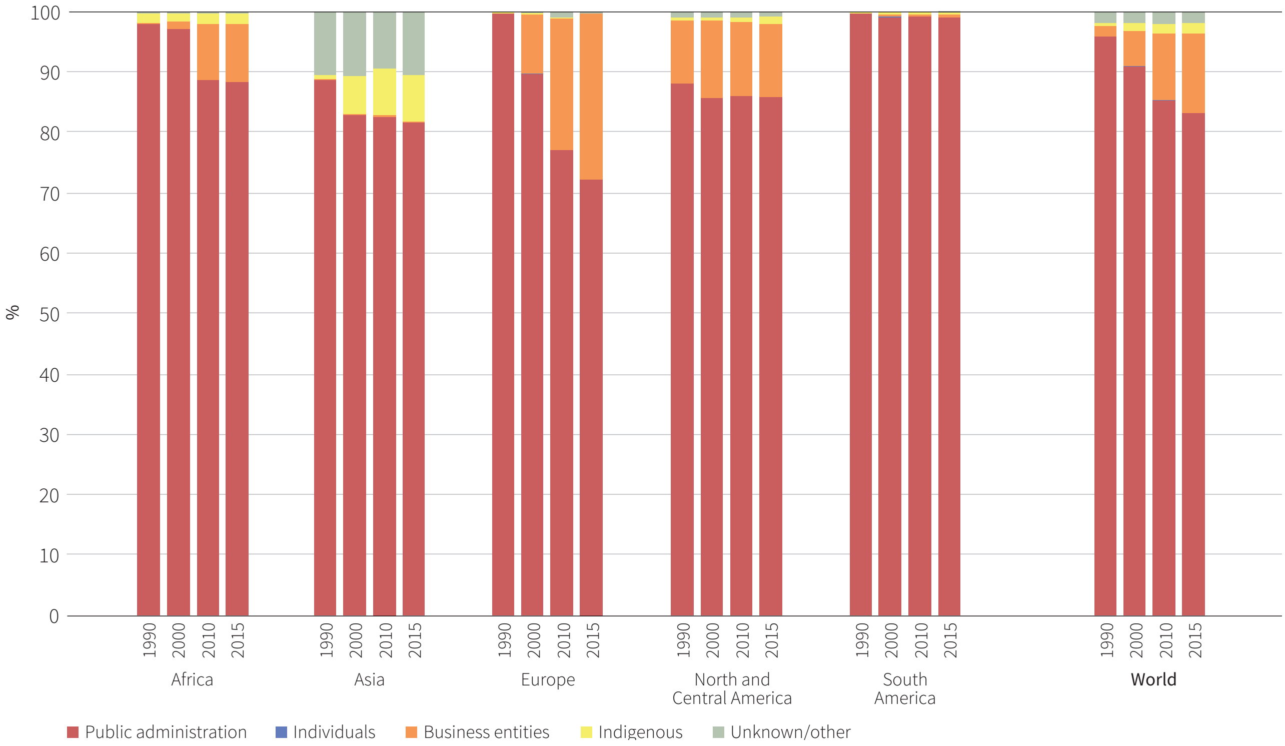


FIGURE 39. Proportion of total area of publicly owned forests, by holder of management rights and region, 1990–2015



entities and institutions in Asia and South America, at 8 percent and 2 percent, respectively. Insufficient data were available to derive meaningful findings for Oceania.

TRENDS

FRA 2020 received time-series data on the allocation of management rights in public forests from 136 countries and territories representing 83 percent of the world's forest area.

The proportion of management rights to publicly owned forest held by public administrations globally decreased from 96 percent in 1990 to 83 percent in 2015, and the proportion held by business entities and institutions grew from 2 percent to 13 percent. The share held by local, tribal and indigenous communities increased from 1 percent to 2 percent (Figure 39).

The share of publicly owned forest managed by public administrations decreased in all regions between 1990 and 2015 and particularly in Europe, where the share dropped from 100 percent in 1990 to 72 percent in 2015. There was an increase in the allocation of public-forest management rights to business entities and institutions, from 0 percent in 1990 to 28 percent in 2015. This shift was due largely to the Russian Federation, where the area of publicly owned forest managed by the private sector increased from zero in 1990 to 244 million ha in 2015.

In Oceania, there was only a minor decrease in the share of public forest managed by public administrations between 1990 and 2015. In Africa, the proportion of publicly owned forest managed by public administrations declined from 98 percent in 1990 to 88 percent in 2015. There was a corresponding increase in the proportion managed by business entities and institutions, from 0 percent to 10 percent.

In Asia, the area of public forest managed by public administrations decreased and the area managed by local, tribal and indigenous communities increased, due largely to India and the implementation of joint forest management (a participatory management regime involving the government and local communities in the regeneration and management of degraded forests). The forest area managed by local, tribal and indigenous communities in India increased from zero in 1990 to about 25 million ha in 2015.

In North and Central America, there was a decrease in the area of forest managed by public administrations, and there were slight increases in the area managed by business entities and institutions and by local, tribal and indigenous communities.

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Disturbances

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Forests are subject to many disturbances that can adversely affect their health and vitality, reduce their capacity to provide a full range of goods and services, and cause tree mortality.

For FRA 2020, countries were requested to report on the forest area affected annually by disturbances, defined as any biotic or abiotic factor adversely affecting the vigour and productivity of the forest that is not a direct result of human activities. Specifically, countries were asked to report on the area of forest affected by insects, disease (caused by bacteria, fungi, phytoplasma or viruses) and severe weather events (e.g. snow, storms or drought) in the period 2000–2017. Reporting on the various categories of disturbances was exclusive and required that only the additional area of forest affected in a given year was reported (and not the cumulative total).

The baseline for reporting status was 2015, for which most data were available. The periods used for the analysis of trends varied depending on the availability of data for the given disturbance category. Overall, however, relatively few data were available for this parameter and it was not possible, therefore, to accurately estimate the total forest area affected by disturbances globally (e.g. some countries that reported on one category of disturbance did not necessarily report on others). Moreover, although it may be easiest to report on this parameter on an annual basis, this approach has the disadvantage of not fully reflecting the magnitude of an outbreak (in the case of pests and diseases). For future FRAs, therefore, further discussion is warranted on how best to obtain and analyse data and whether more information is needed to properly assess this parameter.

In addition to the disturbances listed above, FRA 2020 includes analyses of forest fire (Box 7) and forest degradation (Box 8, p. 95).

Box 7. Fire

Humans have used fire as a management tool for millennia, for example to improve hunting conditions, favour plants used for food or fibre, clear vegetation for agriculture and grazing, facilitate travel and control pests. Fires contribute to the maintenance of some ecosystems, such as savannas, and less-frequent fires in temperate and boreal ecosystems help create habitat mosaics of various ages and stages of regeneration. More or less fire in an ecosystem may change the species mix, habitat structure and biodiversity.[20]

Nearly all disastrous wildfires are associated with extreme fire-danger conditions driven by meteorological factors such as a lack of precipitation, high wind speeds, low humidity and high temperatures.

Wildfires continue to have significant impacts globally, causing the loss of, among other things, human life, built assets, biodiversity, habitat, production and productivity; the degradation of landscapes; and the disruption of livelihoods. Recent damaging fire events associated with heat waves and droughts include those in the Amazon (where weather conditions hastened fire spread) and the Arctic in 2019; Australia in 2009 and 2019/20; Canada in 2016; Chile in 2017;

(Continued)

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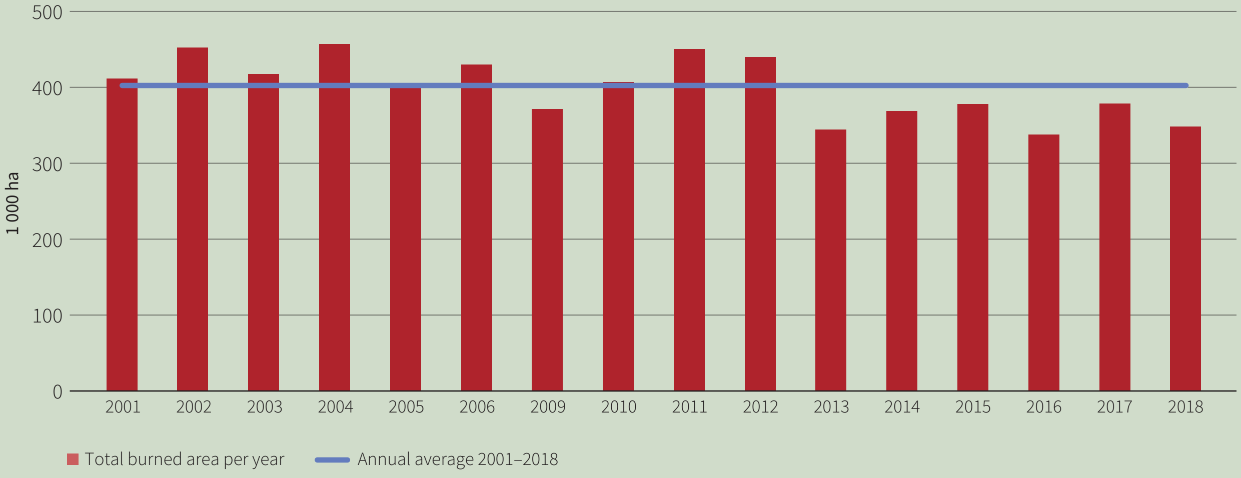
[20] The findings on fire presented in this box are based mainly on the Global Wildfire Information System (Artes *et al.*, 2019) prepared by the Joint Research Centre of the European Commission, the Moderate-Resolution Imaging Spectroradiometer (MODIS) Collection 6 burned-area product (Giglio *et al.*, 2018) and the Global Forest Change product (Hansen *et al.*, 2013). Data on fire from FRA country reports, which were insufficient to produce global statistics, were used to estimate the proportion of burned area by ecological domain and compared with some of the results obtained from the aforementioned remote sensing products.

Box 7. *(Continued)*

Figure 40. Global total land area burned per year, 2001–2018

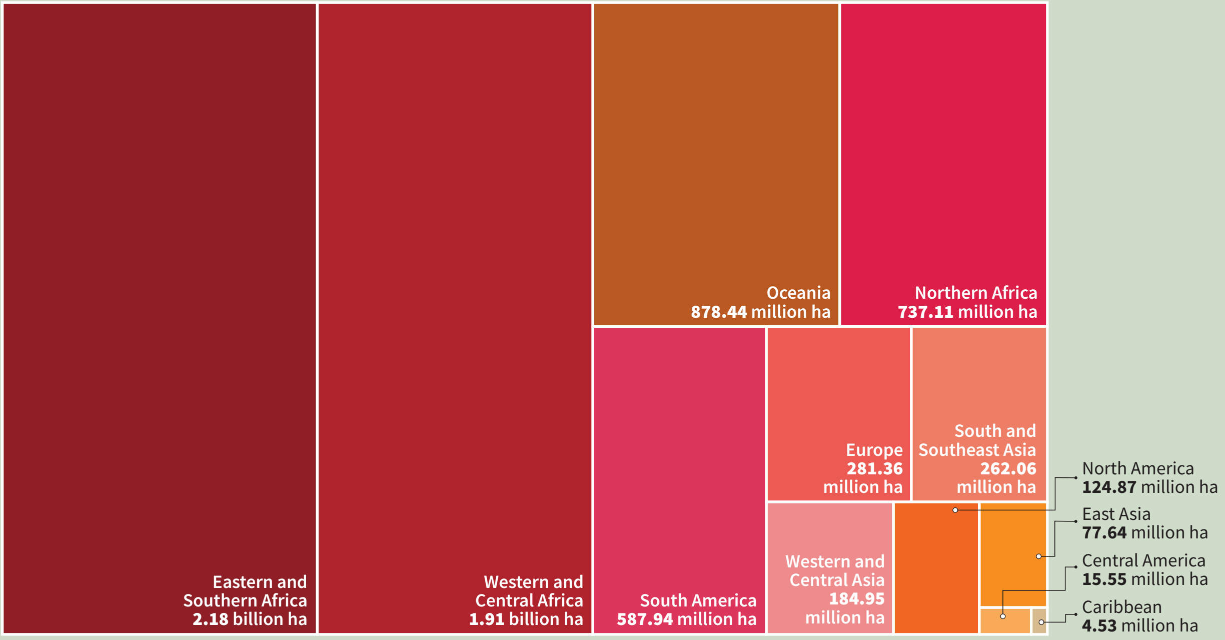


Greece in 2007 and 2018; Indonesia in 2019; Portugal in 2003, 2005 and 2017; the Russian Federation in 2010; and the United States of America in 2013, 2017, 2018 and 2019.

An estimated 90 percent of fires are readily contained and contribute to 10 percent or less of the total area burned. The other approximately 90 percent of the area affected by fire is burned by 5–10 percent of fires. Some wildfires exceed the limits of suppression and are therefore uncontainable.

An estimated 7.20 billion ha of land (i.e. not limited to forests) was burned in 2001–2018 at an average of just more than 400 million ha per year, according to data prepared by the Joint Research Centre of the European Commission (Artes *et al.*, 2019). There was no clear overall trend, although Figure 40

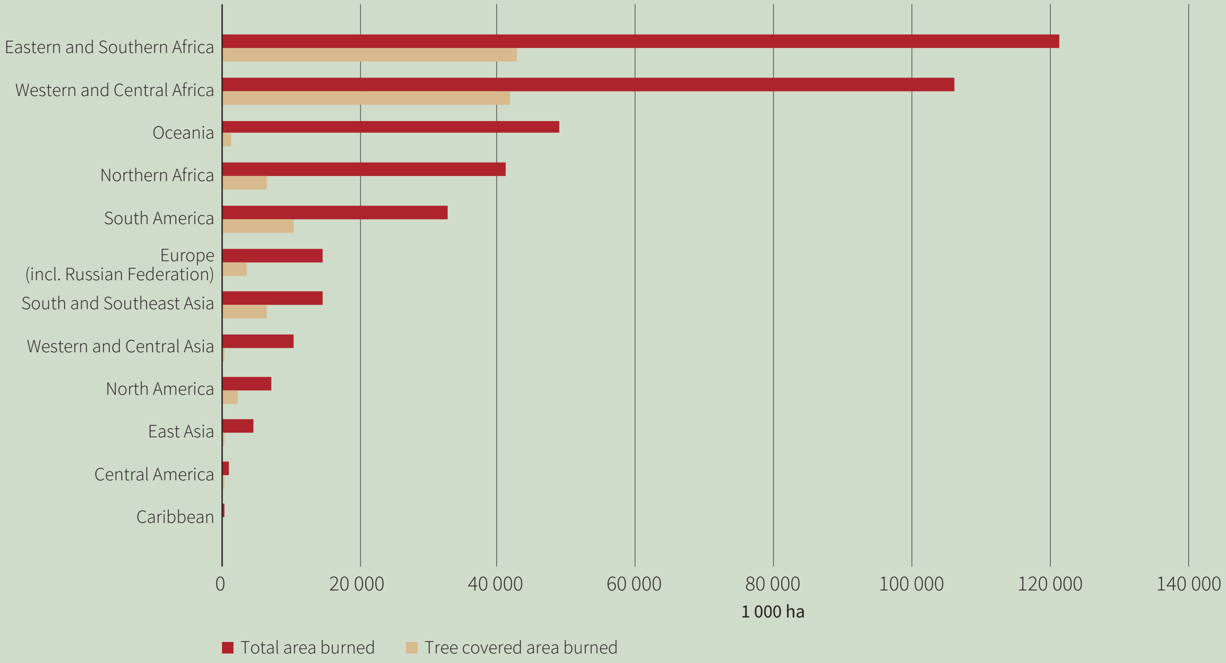
Figure 41. Total land area burned in 2001–2018, by region or subregion



(Continued)

Box 7. *(Continued)*

Figure 42. Annual average land area burned between 2001 and 2018, by region or subregion



shows that the land area burned between 2013 and 2018 was less than the long-term average.

More than two-thirds of the wildfires in 2001–2018 were in Africa. Globally, the largest areas burned were in the subregions of Eastern and Southern Africa, Western and Central Africa, Oceania (mainly Australia), Northern Africa and South America, all exceeding 500 million ha over the period (Figure 41). Notably, Western and Central Africa and Eastern and Southern Africa both averaged more than 100 million ha per year over the period (Figure 42).

The area burned does not always reflect damage or loss, particularly in forests. South America, Northern Africa, Oceania (mainly Australia), Western and Central Africa and Eastern and Southern Africa all have large areas of savanna and grassland, much of which burns cyclically and where fire is an ecological influence.

FAO analysed wildfires in tree-covered areas to obtain a better understanding of global fire dynamics. The analysis, which spanned 2001–2019, used a combination of Moderate-Resolution Imaging Spectroradiometer (MODIS) "burned area collection 6" product and tree-cover information (using a tree-cover threshold of 30 percent) from the Global Forest Change product (Hansen *et al.*, 2013). Note, however, that this analysis is subject to the issues described in Box 4 and Box 5 and should be interpreted with caution.

According to the analysis, 78 percent of burned areas in tree-covered areas between 2001 and 2019 were in Africa (only 5 percent of this area was in Northern Africa).

On average, tree-covered areas accounted for about 29 percent of the total area burned by wildfires between 2001 and 2018 (Table 70), ranging from a low of 23 percent to a high of 34 percent. The largest area of tree-covered land as a proportion of the total wildfire area was in Central America (47 percent), followed by South and Southeast Asia (44 percent). These findings are comparable with data collected for FRA 2020 indicating that 98 million ha of forest, or 3 percent of global forest area, was affected by fire in 2015, which was 26 percent of the total burned area reported by Artes *et al.* (2019) in that year. The fires occurred mainly in the tropics, where they affected about 4 percent of the forest area (Table 71).

Many scientists, fire managers and fire management agencies consider that wildlands face increasingly difficult fire weather conditions, extended fire seasons and larger fires influenced by climate change (e.g. Bowman *et al.*, 2017; IUFRO, 2018; Jolly *et al.*, 2015; Sankey, 2018; San Miguel *et al.*, 2017). Estimates for Europe indicate a potential increase of annual burned area of 120–270 percent above the average in 2000–2010 by 2090 (IUFRO, 2018). Ongoing changes in global fire activity in terms of location, intensity, severity and

(Continued)

Box 7. *(Continued)*

TABLE 70. Proportion of tree-covered burned area in total wildfire area, by region or subregion, 2001–2018

Region/subregion	Share of tree-covered burned area in total wildfire (%)
Eastern and Southern Africa	35
Northern Africa	16
Western and Central Africa	39
East Asia	8
South and Southeast Asia	44
Western and Central Asia	0
Europe	25
Caribbean	19
Central America	47
North America	31
South America	30
Oceania	2
WORLD	**29**

TABLE 71. Country-reported burned area, by ecological domain, 2015

Ecological domain	Forest area affected by fire in 2015 (1 000 ha)	% of forest area
Tropical	72 860	4
Subtropical	9 760	2
Temperate	9 390	1
Boreal	6 030	1
TOTAL	**98 040**	**3**

frequency will likely have immense costs in terms of biodiversity, ecosystem services, human well-being, livelihoods and national economies.

Reliable time-series data on the area of forest burned are needed to better understand trends in wildland and forest fires. Systems for monitoring the area subject to fire could be a starting point for more intensive analyses leading to appropriate intersections with other datasets such as forest cover and their validation at the country level for future FRAs.

Insects

STATUS

Sixty-two countries representing 52 percent of the world's forest area reported on the area of forest affected by insects in 2015. The total area affected was 30.2 million ha, which was 1.4 percent of the total forest area of the reporting countries (Table 72). The most comprehensive reporting was in North and Central America (98 percent of the region's forest area), followed by Europe (95 percent) and Asia (47 percent).

The region with the largest forest area affected by insects in 2015 was North and Central America, at 20.4 million ha. The largest proportion of forest area disturbed by insects was in Asia: the 8.74 million ha affected in that region accounted for 3.0 percent of the total forest area of the reporting countries.

An estimated 524 000 ha of forest was disturbed by insects in Europe in 2015, which was 0.1 percent of the forest area of reporting countries.

On average, the forest area affected by insects in reporting countries was less than 2 percent in 2015. Nevertheless, ten countries reported that more than 2 percent of their forest area was so affected; the highest percentages were in the Republic of Moldova, at 19 percent, Uruguay, at 7 percent (although data were available only for planted forests) and Honduras, at 6 percent.

TRENDS

Thirty-six countries and territories, accounting for 25 percent of the world's forest area, reported complete time-series data for the forest area disturbed annually by insects in 2000–2017. Given the low reporting and limited representativeness of the sample, the analysis of trends was confined to 2002–2016, a period with a relatively high percentage of reporting.

The average annual area affected by insects over the period was 29.1 million ha (in 44 countries representing 47 percent of the world's forest area (Table 73). The lowest area affected in any given year was 23.7 million ha in 2011 and the highest was 35.3 million ha in 2013.

In the analysed period, reporting was highest in North and Central America (with reporting countries representing 98 percent of the region's total forest area), followed by Europe (86 percent) and Asia (45 percent). Oceania and Africa had the lowest reporting, at 5 percent and 4 percent, respectively, and no complete time series was available for any of the countries in South America.

Of the three regions with the most comprehensive reporting, there was greater variability in the area affected

TABLE 72. Forest area affected by insects, by region, 2015

Region	Data availability		Forest affected by insects	
	No. of reporting countries	% of total forest area	Area (1 000 ha)	% of forest area
Africa	6	7	436	1.0
Asia	11	47	8 743	3.0
Europe	30	95	524	0.1
North and Central America	9	98	20 381	2.7
Oceania	3	5	1.0	n.s.
South America	3	7	130	0.2
WORLD	**62**	**52**	**30 215**	**1.4**

Note: n.s. = not significant.

TABLE 73. Forest area disturbed by insects annually, by region, 2002–2016

Region	Data availability		Forest area affected annually (1 000 ha)		
	No. of reporting countries	% of total forest area	Maximum	Minimum	Average
Africa	5	4	50	16	37
Asia	8	45	9 244	7 162	8 419
Europe	20	86	1 385	256	506
North and Central America	7	98	25 903	14 656	20 146
Oceania	3	5	40	1.0	12
WORLD	**44**	**47**	**35 277**	**23 736**	**29 119**

Note: No countries or territories in South America provided complete time series for the analysed period.

by insects in North and Central America, where an average of 20.1 million ha was affected annually, ranging from 14.7 million ha in 2011 to 25.9 million ha in 2013. The peak in 2013 was due to a massive attack in Canada of defoliator insects, mainly the forest tent caterpillar. According to Canada's country report, forest tent caterpillar outbreaks follow a well-established pattern of occurrence about every 11 years; comparable peaks in the area defoliated by this insect were observed in 1990–1991 and 2000–2001. The average area affected by insects in Europe in 2002–2016 was 506 000 ha per year and the average in Asia was 8.42 million ha per year.

Diseases

STATUS

Fifty-one countries representing 42 percent of the total forest area reported data on the area of forest affected by disease in 2015. The total area so affected was 6.60 million ha, which was 0.4 percent of the forest area of the reporting countries (Table 74). The most data on this parameter was for Europe, where the reporting countries represented 96 percent of the region's forest area, followed by North and Central America (50 percent) and Asia (38 percent).

North and Central America reported the largest area of forest affected by disease in 2015, at 3.75 million ha (1 percent of the forest area of the region's reporting countries), followed by Asia and Europe.

TRENDS

Thirty countries and territories, representing 24 percent of the forest area, reported complete time-series data for the forest area affected by disease in 2000–2017. More comprehensive reporting was available for 2002–2017, with data provided by 33 countries representing 37 percent of the world's forest area. Coverage in this period was highest in Europe, with reporting countries accounting for 86 percent of the region's forest area, followed by North and Central America (50 percent), Asia (38 percent), Oceania (5 percent) and Africa (3 percent); no countries or territories in South America provided complete time series for the analysed period.

The average forest area affected by disease in reporting countries in 2002–2017 was 4.76 million ha, with a low of

TABLE 74. Forest area affected by disease, by region, 2015

Region	Data availability		Forest affected by disease	
	No. of reporting countries	% of total forest area	Area (1 000 ha)	% of forest area
Africa	4	6	301	0.8
Asia	5	38	1 409	0.6
Europe	32	96	821	0.1
North and Central America	4	50	3 751	1.0
Oceania	3	5	62	0.6
South America	3	7	259	0.4
WORLD	**51**	**42**	**6 603**	**0.4**

TABLE 75. Forest area affected annually by disease, by region, 2002–2017

Region	Data availability		Forest area affected annually (1 000 ha)		
	No. of reporting countries	% of total forest area	Maximum	Minimum	Average
Africa	2	3	1.1	0.1	0.4
Asia	4	38	1 393	763	1 152
Europe	19	86	383	153	250
North and Central America	4	50	5 129	877	3 257
Oceania	3	5	335	1.0	97
WORLD	**33**	**37**	**6 629**	**2 177**	**4 757**

Note: No countries or territories in South America provided complete time series for the analysed period.

2.18 million ha in 2002 and a high of 6.63 million ha in 2011 (Table 75).

Of the three regions with the highest reporting, North and Central America had the highest variability in the area affected by disease, with a low of 877 000 ha in 2002, a high of 5.13 million ha in 2011 and an average of 3.26 million ha. The area of forest affected by disease was relatively stable over the period in Asia and Europe.

Severe weather events

STATUS

Forty-eight countries and territories representing 37 percent of the total forest area reported data on the area of forest affected by severe weather events in 2015. The total area affected was 3.83 million ha, which was 0.3 percent of the forest area of the reporting countries.

The most comprehensive reporting of the forest area disturbed by severe weather events was in Europe (95 percent of the region's forest area), followed by North and Central America (50 percent); reporting was below 10 percent in the other regions.

Among the regions, North and Central America reported the largest area of forest affected by severe weather events in 2015, at 2.08 million ha (0.5 percent of the forest area of reporting countries in the region). The second-largest area was in Europe, at 866 000 ha (0.1 percent) (Table 76).

TRENDS

Thirty-two countries and territories representing 24 percent of the world's forest area reported annual data on the area of forest affected by severe weather events in 2000–2017. The analysis presented here is for 2002–2015, with data for 37 countries and territories representing 33 percent of the world's forest area. Reporting was highest in Europe, with reporting countries accounting for 87 percent of the region's forest area, followed by North and Central America (50 percent), Asia (8 percent) Oceania (5 percent) and Africa (3 percent). No countries or territories in South America provided complete time series for the analysed period.

The average forest area affected by severe weather events globally over the period was 5.96 million ha, with a high of 9.38 million ha in 2006 and a low of 2.79 million ha in 2015 (Table 77).

TABLE 76. Forest area affected by severe weather events, by region, 2015

Region	Data availability		Forest affected by severe weather events	
	No. of reporting countries	% of total forest area	Area (1 000 ha)	%
Africa	6	6	415	1.1
Asia	4	8	310	0.6
Europe	28	95	866	0.1
North and Central America	4	50	2 076	0.5
Oceania	3	5	n.s.	n.s.
South America	3	7	160	0.3
WORLD	**48**	**37**	**3 828**	**0.3**

Note: n.s. = not significant.

TABLE 77. Forest area affected by severe weather events, by region, 2002–2015

Region	Data availability		Forest area affected severe weather events (1 000 ha)		
	No. of reporting countries	% of total forest area	Maximum	Minimum	Average
Africa	5	3	22	1.1	6.6
Asia	4	8	461	23	139
Europe	20	87	784	230	332
North and Central America	4	50	9 081	2 076	5 481
Oceania	3	5	43	0.0	4.0
WORLD	**37**	**33**	**9 381**	**2 790**	**5 962**

Note: No countries or territories in South America provided complete time series for the analysed period.

The area affected varied considerably over time, especially in North and Central America, where it ranged from a high of 9.08 million ha in 2006 to a low of 2.08 million ha in 2015; the annual average in that region was 5.48 million ha. In Europe, the highest yearly value was 784 000 ha in 2005, the lowest was 230 000 ha in 2006, and the annual average was 332 000 ha.

Box 8. Forest degradation

Human activities, severe climatic events, fire, pests, diseases and other environmental disturbances may degrade forests and thereby reduce the provision of forest goods and services, biodiversity values, productivity and health. Forest degradation may also negatively affect other land uses (e.g. by causing a loss of downstream water quality) and cause the emission of greenhouse gases. Monitoring changes in forest quality, therefore, is an essential part of sustainable forest management.

The Global Forest Resources Assessment (FRA) 2020 collected information on degraded forests as part of the reporting process. For the first time, FRA requested countries to indicate whether they monitored forest degradation and, if so, to provide the definition of degraded forest they used and a brief description of the monitoring process and results.

Fifty-eight countries, representing 38 percent of the global forest area, reported that they monitor the area of degraded forest (Table 78). Almost one-third of the reporting countries were in Africa, and they represented 28 percent of that region's forest area. Reporting was most comprehensive in South America, where the

(Continued)

Box 8. *(Continued)*

reporting countries accounted for 79 percent of the region's forest area. Seventy-two percent of the forest area of reporting countries was in the tropical climatic domain; the boreal forest domain, in contrast, accounted for only 4 percent (Figure 43).

Countries use various definitions of degraded forest and it is infeasible, therefore, to aggregate and compare data on forest area at the regional and global levels. Most definitions are based mainly on the presence of forest disturbances. Some countries specify the type of disturbance (mostly anthropogenic factors such as logging and fire) and others are more generic.

Other criteria commonly used by countries in their definitions of degraded forest include change in forest structure (including decrease in forest canopy) and loss of productivity and forest goods (Figure 44). Few countries apply quantitative criteria in their definitions.

Field inventories and observations are the most commonly used methods for monitoring and assessing the area of degraded forest, followed by remote sensing and mapping (Figure 45). The low number of reporting countries and the overall lack of data on degraded forests is explained partly by the difficulty of assessing degraded forest areas and a lack of available tools and methods. Nevertheless, many countries have started monitoring forest degradation in recent years.

TABLE 78. **Number and forest area of countries reporting on forest degradation, by region**

Region	No. of reporting countries	Forest area of reporting countries (1000 ha)	% of total forest area
Africa	18	178 226	28
Asia	16	271 887	44
Europe	7	18 063	2
North and Central America	6	383 297	51
Oceania	3	39 519	21
South America	8	663 849	79
WORLD	**58**	**1 554 841**	**38**

Figure 43. Proportion of total forest area of countries reporting on forest degradation, by climatic domain

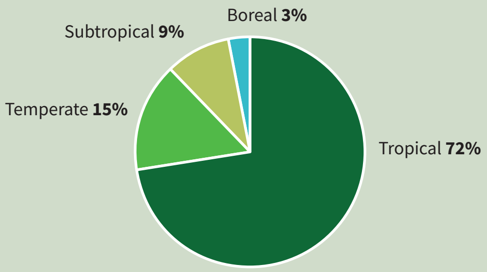
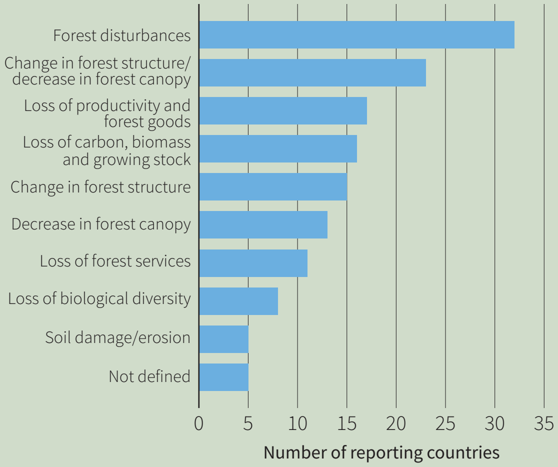
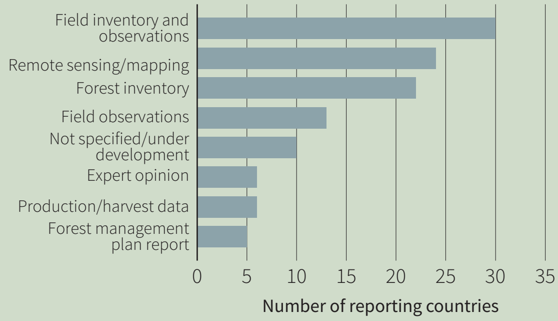


Figure 44. Criteria used in national definitions of degraded forest



Note: Many countries use several criteria in their definitions of degraded forest.

Figure 45. Methods applied by countries for monitoring degraded forest



Note: Some countries use a combination of methods to monitor their degraded forests.

8

Policies and legislation

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Many countries have developed policies and laws designed to promote the sustainable and multipurpose use of forests and trees. Such policies and laws serve as a foundation for sustainable forest management by, for example, promoting legal timber trade, involving stakeholders in forest management, addressing forest tenure and providing incentives.

The findings of FRA 2020 presented in this chapter show that most countries – encompassing the large majority of the world's forests – have formalized the principles of sustainable forest management in forest-related policies and laws. The existence of such policies and basic legislation, however, does not, on its own, ensure sustainable forest management; other possible indicators include the existence of specialized legislation on forest use; systems for ensuring the legality of timber trade; traceability systems for wood products; appropriate capacities in relevant institutions; and mechanisms for involving stakeholders in forest-related decision-making processes and supervision.

Findings

FRA 2020 received information on forest policies in 2020 from 187 countries and territories representing 99 percent of the total forest area. Of these, 164 countries and territories (also representing about 99 percent of the total forest area) indicated that they have national forest policies. The large majority reported that they have national-level policy statements; only three countries reported that they have subnational statements but no national forest policy statement (or they did not report on the latter). Twenty-three countries and territories reported that they had no forest policy statement.

One hundred and seventy-two countries and territories representing 99 percent of the total forest area indicated that they have forest legislation. The other 64 countries and territories (representing 1 percent of the total forest area) did not report on this aspect or did not provide an affirmative response on the presence of forest legislation. All but one of the countries that responded in the affirmative (i.e. 171 countries) indicated that they have specific forest-targeted legislation at the national level. Belgium reported that its forests are regulated through subnational but not national legislation.

A total of 142 countries and territories representing 95 percent of the total forest area reported that they have platforms to enable the participation of stakeholders in forest policy development; 40 countries and territories indicated that they do not have such a platform and 54 did not report. Of the 142 countries with platforms, 44 are in Africa, 29 are in Asia, 32 are in Europe and 17 are in North and Central America, and there are ten each in Oceania and South America. Only three countries (all in Europe) reported having subnational rather than national platforms to enable stakeholder participation in forest policy development.

Ninety-four countries and territories reported the existence of traceability systems for wood products[21] at the national level and another three (including the United States of America) reported that such systems exist at the subnational level; in total, these 97 countries and territories represent 84 percent of the total forest area. In South America, 13 of the 14 countries and territories that reported on this aspect indicated the existence of traceability systems for wood products. Wood-product traceability systems exist in 25 countries and territories in Europe (accounting for nearly 95 percent of the region's forest area), 11 in North and Central America (91 percent), 32 in Africa (79 percent), 2 (Australia and Niue) in Oceania (72 percent), and 14 in Asia (48 percent).

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[21] Traceability systems for wood products are defined here as systems that provide the ability to trace the origin, location and movement of wood products by means of recorded identifications. This involves two main aspects: 1) identification of the product by marking; and 2) the recording of data on the movement and location of a product all the way along the production, processing and distribution chain.

9

Employment and education

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Employment in the forest sector is an important indicator of the impact of forests on people, and it helps quantify the contribution of the sector to broader economic objectives. Employment provides income; because most forest activities occur in rural areas that are often poorer than average, this indicator helps in measuring the contribution of the forest sector to poverty alleviation. Data on forest-related education can indicate a country's capacity for, and commitment to, managing, conserving and enhancing forests and building institutional frameworks to promote sustainable forest management.

Employment

FRA 2020 collected data on full-time-equivalent employment in the forestry and logging sector, as defined by the Industrial Classification of all Economic Activities (United Nations Statistics Division, 2008, p. 75):

> **This division includes the production of roundwood for the forest-based manufacturing industries (ISIC [International Standard Industrial Classification] divisions 16 and 17) as well as the extraction and gathering of wild growing non-wood forest products. Besides the production of timber, forestry activities result in products that undergo little processing, such as fire wood, charcoal, wood chips and roundwood used in an unprocessed form (e.g. pit-props, pulpwood etc.). These activities can be carried out in natural or planted forests. It excludes employment in forest-based manufacturing industries (ISIC divisions 16 and 17).**

Countries were requested to report disaggregated data by gender, where available, for four reference years, based on the average of the following three-year periods: 1989–1991 for 1990; 1999–2001 for 2000; 2009–2011 for 2010; and 2014–2016 for 2015. Overall, the outcomes confirmed the need to improve the quality of employment data. Data collection on this indicator presents challenges in terms of definitions and methodologies; nevertheless, the data collected for FRA 2020 suggest an ongoing decreasing trend in employment in the forestry and logging sector.

An in-depth revision of the data-collection process, and collaboration with other global data providers such as the International Labour Organization, would help improve employment statistics.

STATUS

FRA 2020 received information on employment in forestry and logging in 2015 from 136 countries representing 91 percent of the world's forests. Total employment in the forest sector was estimated at 12.5 million people (full-time equivalent) in 2015, almost 90 percent of whom were in Asia and Africa (Table 79). Asia accounted for more than 70 percent (8.90 million people employed) of total employment globally, led by India (6.23 million people employed) and China (1.15 million people).

Seventy-one countries representing 38 percent of the world's forests reported gender-disaggregated data. The total number of employees in forestry and logging in these countries in 2015 was estimated at 3.88 million, of whom 58 percent were male and 42 percent were female.

TABLE 79. **Number of people employed in forestry and logging, by region, 2015**

Region	Data availability		No. of people employed (1 000 full-time equivalent)
	No. of reporting countries	% of total forest area	
Africa	34	62	2 135
Asia	29	94	8 896
Europe	38	99	696
North and Central America	14	98	406
Oceania	10	80	28
South America	11	97	332
WORLD	**136**	**91**	**12 492**

TABLE 80. Number of people employed in forestry and logging, by region, 1990–2015

Region	Data availability		No. of people employed (1 000 full-time equivalent)			
	No. of reporting countries	% of total forest area	1990	2000	2010	2015
Africa	27	54	1 740	2 003	1 969	2 030
Asia	22	84	9 948	9 338	8 735	8 511
Europe	35	99	1 036	883	658	691
North and Central America	7	88	220	192	169	189
Oceania	4	5	6	9	9	9
South America	9	89	251	252	341	301
WORLD	**104**	**81**	**13 201**	**12 677**	**11 881**	**11 730**

TRENDS

The number of people employed in forestry and logging decreased by 1.47 million between 1990 and 2015, although the rate of decrease slowed in the period 2010–2015; decreases occurred in all regions except Africa and South America (although insufficient data were available to determine employment trends in Oceania) (Table 80).

The decline in employment in Asia mainly reflected a steep decline in China, where the number of people employed more than halved between 1990 and 2015 (due partly to a partial logging ban in the late 1990s). The decline in employment in Europe was due to the restructuring of formerly centrally planned economies, which, in some countries, led to decreased production and lower employment. More generally, the privatization of forestry in Eastern Europe led to large increases in labour productivity and consequently to a decline in employment. Increases in employment in Africa and South America occurred partly because roundwood production grew faster than labour productivity.[22]

Education

Education on forests will be crucial for enabling societies to address challenges such as climate change, energy demand, environmental degradation and biodiversity loss and to adapt to changing economic, social and environmental conditions. The forest managers of the future are likely to require a wide range of skills, such as in implementing integrated landscape approaches and participatory forest management, the adoption of new technologies, and managing the multifunctional roles of forests.

FRA 2020 sought data on the number of graduates in post-secondary education programmes with a focus on forests and related subjects, disaggregated by gender and level of education. The collected data indicate an increase in the number of students graduating in forestry, including the strong involvement of women in forest education and progress towards gender parity.

STATUS

FRA 2020 received information on forest education from 119 countries and territories representing 86 percent of the global forest area. Reporting varied considerably between regions: for example, the reporting countries represented 97 percent of the regional forest areas in Europe and North and Central America and 55 percent in Africa.

Globally, 331 000 students graduated in forestry in 2015 (Table 81), which is equivalent to 95 graduates per 1 million ha of forest. About 6 000 doctoral degrees were awarded in forestry in that year, as well as 28 200 master's degrees, 113 000 bachelor's degrees and 149 000 technical certificates. Most countries provided data for only a few levels of education; thus, the aggregated numbers at the global and regional levels are underestimated, particularly in Africa, Europe (where data by level of education were missing for the Russian Federation) and Oceania.

The largest number of graduated students in all forestry degrees combined was in Asia, with 194 000 graduated students in 2015 (Table 82), of whom the majority (60 percent) were graduates with technical certificates or diplomas. Asia also had by far the highest ratio of forestry graduates by forest area (at 336 forestry-graduated students per 1 million ha of forest). The number of graduated students in China accounted for 82 percent of the regional total.

The second-largest number of graduated students was in North and Central America, at 65 900, of whom the majority (53 percent) graduated with bachelor's degrees. The number of graduated students was low in Africa and Oceania, at least partly because of the relatively small number of countries reporting on this parameter.

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[22] The explanations for employment trends in this paragraph draw on FAO (2008).

Women represented about 42 percent of all graduated forestry students in 2015, with some differences by education level. The proportion of women graduating in forestry in 2015 was highest in Oceania, at 63 percent, although the total number of graduates in that region was small. Women accounted for 50 percent of all graduates in North and Central America.

Males and females were represented almost equally in master's and bachelor's degrees (with women accounting for 48 percent in both), but women were underrepresented in doctoral degrees and technical certificates, at about one-third of graduated students. The proportion of women by education level varied notably between regions: for example, the lowest proportion of women graduating with doctoral degrees was 10 percent in Asia, and the highest was 47 percent in North and Central America. Europe had the lowest proportion of women in forestry education, at 23 percent, but the percentage of women in that region graduating with doctoral degrees was much higher than the global average, at 43 percent.

TRENDS

The countries and territories providing complete time-series data for one or more education category represent only about half the global forest area; therefore, the trends reported here should be treated with caution. Overall, there was a substantial increase in the number of graduated forestry students between 2000 and 2015, with the number more than doubling in all levels of education (Figure 46).

For those countries providing time series of gender-disaggregated data, the proportion of women graduating in forestry increased between 2000 and 2015 (Figure 47). This was true for all education levels, although the number of women graduating with doctoral degrees declined between

TABLE 81. Number of graduated students, by level of education, 2015

Level of education	Data availability		Graduated students	
	No. of reporting countries	% of total forest area	Total no. of graduates	% female
Doctoral degree	95	59	5 593	33
Master's degree or equivalent	104	62	28 210	48
Bachelor's degree or equivalent	105	62	112 631	48
Technical certificate or diploma	95	47	149 358	31
Not specified	2	20	35 120	42
TOTAL GRADUATES			**330 912**	**33**

TABLE 82. Graduated students in forestry, by region and level of education, 2015

Region	Doctoral degree	Master's degree or equivalent	Bachelor's degree or equivalent	Technical certificate or diploma	Not specified	Total number of graduates	No. of graduates per 1 million ha of forest	% female
Africa	86	766	1 836	3 035	120	5 843	17	30
Asia	2 002	12 618	63 624	115 379	–	193 623	336	36
Europe	417	3 297	6 705	10 416	35 000	55 835	56	23
North and Central America	1 727	9 559	34 709	19 917	–	65 912	91	50
Oceania	56	3	58	501	–	618	4	63
South America	1 305	1 967	5 699	110	–	9 081	13	36
WORLD	**5 593**	**28 210**	**112 631**	**149 358**	**35 120**	**330 912**	**95**	**42**

FIGURE 46. Number of forestry students, by degree category, 2000–2015

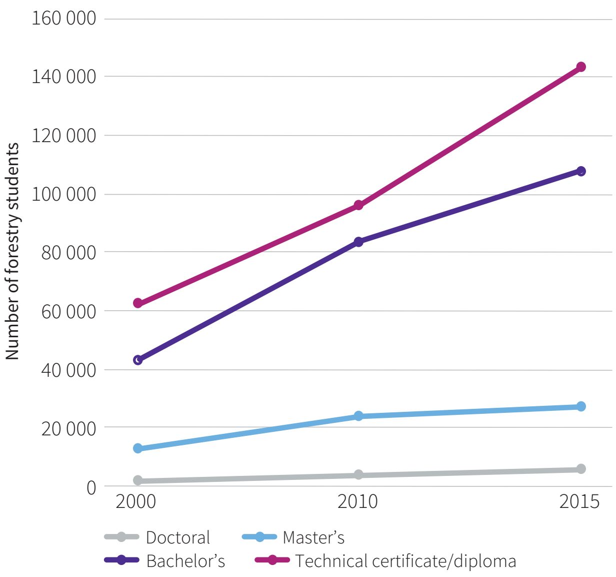
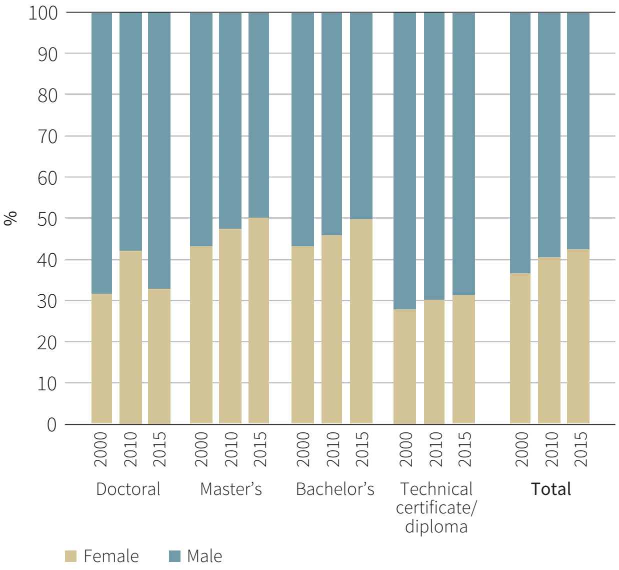


FIGURE 47. Proportion of female and male graduated forestry students, by education level, 2000–2015



2010 and 2015 after increasing substantially between 2000 and 2010. Women, therefore, are increasingly participating in forest-related education in many countries, but efforts may still be needed to achieve gender parity, especially for doctoral degrees and technical qualifications.

10

Non-wood forest products removals and value

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Forests provide a wide range of non-wood forest products (NWFPs), including foods, medicines, fodder, aromatic products, wild meat and honey. Most global statistical compilations and reporting on the production, trade and consumption of forest products focus on wood products (Box 9, p. 111), and data collection on NWFPs has rarely been systematic, despite their considerable economic and social importance. There are two main reasons for this: NWFPs are largely the domain of the informal sector; and the range of NWFPs is highly diverse.

For FRA 2020, countries and territories were asked to identify the ten most important NWFPs, estimate the quantity of removals in 2015 and commercial values of marketed production, and provide information on key NWFP species. FRA 2020 defined NWFPs as "goods derived from forests that are tangible and physical objects of biological origin other than wood"; information was categorized according to product characteristics (i.e. plant- or animal-based) and end uses.[23]

Information on NWFPs is still poor: in addition to the reasons mentioned above, there is a lack of harmonization of definitions and difficulties associated with the collation and standardization of data from different sources.

Despite the scarcity of information, NWFPs are economically important in many countries and for large numbers of people. The collection of better data on NWFPs would help in determining their contributions to healthy diets, nature conservation, poverty alleviation, economic development and the SDGs and in ensuring their sustainable management. A starting point would be to improve the methods used for data collection and to increase statistical support for those countries lacking sufficient capacity to do so.

COVERAGE

FRA 2020 received information on NWFPs from 124 countries and territories representing 73 percent of the global forest area. Information was provided by countries representing more than 75 percent of the forest area in all regions except Europe, where no data were forthcoming from the Russian Federation (Table 83).

Although countries and territories were asked to identify their ten commercially most important NWFPs for 2015, not all did so, with the average varying from five in North and Central America to eight in Africa and South America. Some countries identified more than ten such products, including Argentina (50 products), Brazil (37), Canada (which, in reporting on wild pelts, specified quantities and values for 24 species), and the Central African Republic (23).

FOREST PRODUCT CATEGORIES OF MAJOR IMPORTANCE

NWFPs that constitute foods represent almost half of all NWFPs reported (Figure 48). They include edible non-animal products – fruits, vegetables, spices and mushrooms – as well as animal products such as honey, insects and wild meat.

Edible plant products are of considerable importance in Africa, with 77 percent of reporting countries providing information on these. Edible plant products are also important in other regions; for example, a huge diversity – such as nuts and many species of fruits, vegetables and spices – are marketed in Asia. European plant-based forest foods mainly comprise berries, nuts (pine nuts and chestnuts) and mushrooms.

Fifty-six of the 124 reporting countries and territories provided information on medicinal and aromatic plants (this was the second-most reported category in Africa, Asia and Oceania). "Raw material for handicrafts, utensils and construction" – which includes bamboo, rattan, palm leaves, cork and other species – was the most-reported

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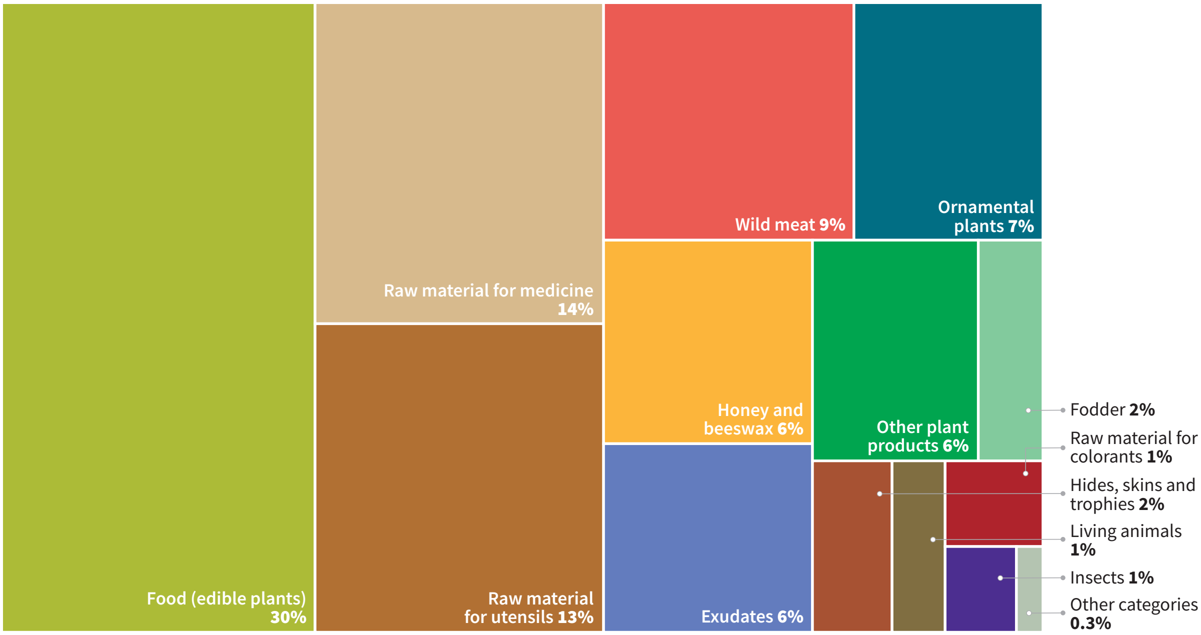
[23] For FRA 2020, NWFPs were classified as either plant-based or animal-based. **Plant-based products** include food, fodder, raw material for medicine and aromatic products, raw material for colorants and dyes, raw material for handicrafts, utensils and construction, ornamental plants, exudates, and other plant products. **Animal-based products** comprised wild meat, honey and beeswax, hides, skins and trophies, living animals, raw material for medicine, raw material for colorants, other edible products and other non-edible products.

TABLE 83. **Reporting coverage for non-wood forest products**

Region	No. of reporting countries	Forest area (2015)		Population in 2015*		
		(1 000 ha)	% of regional forest area	Rural population (1 000 persons)	Urban population (1 000 persons)	% of regional population**
Africa	39	497 814	76	520 685	377 572	75
Asia	20	548 334	89	2 005 297	1 864 723	88
Europe	33	193 269	19	149 273	422 155	77
North and Central America	11	734 863	97	100 142	401 610	88
Oceania	10	182 968	99	11 787	26 056	96
South America	11	831 070	97	66 020	343 506	98
WORLD	**124**	**2 988 316**	**73**	**2 853 203**	**3 435 622**	**85**

Note: Population data were obtained from United Nations, Department of Economic and Social Affairs, Population Division (2018). * The table reports data on population and its disaggregation by urban/rural to highlight the potential impacts of the use of non-wood forest products (NWFPs). People living in rural areas are the primary users of NWFPs, both for direct household use and for commercial sale. Urban dwellers often derive indirect benefits from NWFPs, such as the consumption of NWFPs considered to be health products or delicacies and the use of NWFPs such as cork and bamboo manufactured products in their homes and workplaces. ** Regional populations include only those countries in the region reporting on NWFPs.

FIGURE 48. Global importance of non-wood forest product categories, 2015



product group in Central America, South America and Oceania and the third most-reported product group in Africa and Asia.

ECONOMIC VALUE OF NON-WOOD FOREST PRODUCTS

Eighty-one countries and territories reported quantitative information on the economic value of NWFPs, representing 54 percent of the global forest area; the percentage was even lower in Asia (33 percent of the forest area) and Africa (27 percent). Given the low coverage, the data reported here should be viewed as a considerable underestimate of the economic value of NWFPs.

Globally, the reported value of NWFPs was about USD 7.71 billion in 2015, with plant products accounting for 80 percent of this value. The single-largest product group, by value, was edible plants (37 percent of the total value), followed by ornamental plants (22 percent), wild meat

(9 percent), other plant products (8 percent), honey and beeswax (7 percent), and medicinal and aromatic plants (5 percent) (Figure 49).

In Europe, the main product groups were ornamental plants (39 percent), edible plants (30 percent), wild meat (17 percent) and bee products (8 percent). The high value of the ornamental plants product group was due mainly (97 percent) to Christmas trees, where the market was dominated by Germany (51 percent), the United Kingdom of Great Britain and Northern Ireland (28 percent) and Denmark (8 percent).

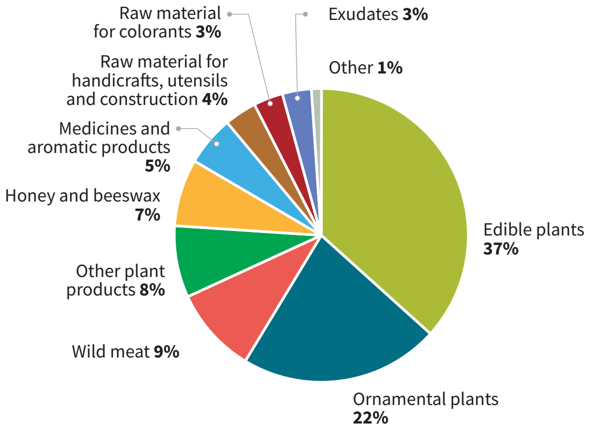
In North and Central America and in South America, the most economically important categories are edible plant products (49 percent of total value), other plant products (21 percent) and exudates (10 percent) (the latter are especially important in South American countries).

In Africa, the most commercially important product groups reported were edible plants (45 percent of the commercial value), medicinal and aromatic plants (20 percent) and raw material for colorants (19 percent).

The most economically important product group in Asia in 2015 was edible plants, at 42 percent of the reported value, followed by raw materials for handicrafts, utensils and construction (25 percent) and other plant products (21 percent).

In Oceania, honey and beeswax accounted for the highest reported value, at 68 percent (although this figure was due entirely to Australia and New Zealand). The product group "wild meat, hides, skins and trophies" accounted for 17 percent of the regional value.

FIGURE 49. Non-wood forest product categories as a proportion of total reported economic value, 2015



Note: Numbers may not sum to the totals indicated and percentages may not tally to 100 due to rounding.

Box 9. Wood removals

The volume of wood removed from forests is an indicator of the economic and social roles of forest resources in national economies and dependent local communities. In most countries, revenue from harvested wood is the single-largest income source from forests. Information on wood removals also helps in monitoring the use of forest and tree resources by comparing actual removals with the sustainable potential.

Data on wood removals were requested from countries in Global Forest Resources Assessments in 2005, 2010 and 2015; in contrast, the analysis presented here is based on data on removals contained in the FAOSTAT database (FAO, 2020a). FAO and partner agencies (Eurostat, the International Tropical Timber Organization and the United Nations Economic Commission for Europe) annually collect statistics on removals of roundwood, the production of various wood and paper products, and trade in these products. Global statistics on wood and paper products (including wood removals) have been collected and published annually in the *FAO Yearbook of Forest Products* (e.g. FAO, 2020b) since 1947. To reduce the reporting burden on countries, and because detailed annual statistics are already available in FAOSTAT, wood removals were not included in the Global Forest Resources Assessment 2020 questionnaire.

Global wood removals were estimated at 3.97 billion m^3 in 2018 (the latest available data), of which about half was industrial roundwood and the other half woodfuel. This amount includes removals from forests, other wooded land and trees outside forests. There are significant differences among the regions in the percentages of the wood harvest used as woodfuel, ranging from 90 percent in Africa and 62 percent in Asia to less than 25 percent in Europe, North America and Oceania (removals were roughly even for woodfuel and

(Continued)

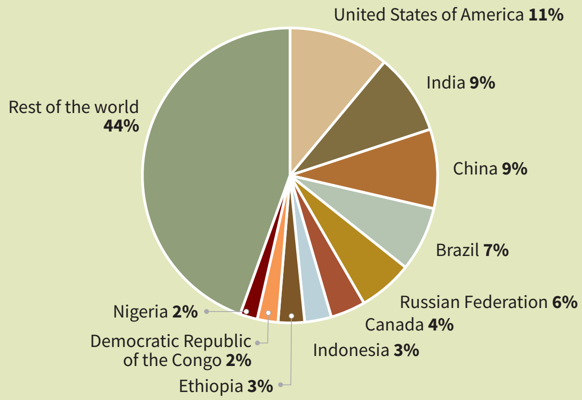
Box 9. *(Continued)*

TABLE 84. Industrial wood and woodfuel removals, by region and subregion, 1990–2018

Region/subregion	Wood removals (million m³)											
	Industrial roundwood				Woodfuel				Total			
	1990	2000	2010	2018	1990	2000	2010	2018	1990	2000	2010	2018
Eastern and Southern Africa	29	36	35	37	200	250	293	317	229	286	327	354
Northern Africa	3	4	3	2	45	50	54	58	48	53	58	60
Western and Central Africa	32	35	37	41	245	301	351	383	277	337	388	425
Total Africa	**61**	**71**	**72**	**79**	**445**	**551**	**644**	**700**	**506**	**623**	**715**	**779**
East Asia	123	117	184	211	295	236	196	176	418	353	380	387
South and Southeast Asia	137	142	177	206	590	563	557	527	727	705	734	733
Western and Central Asia	9	14	19	25	11	9	11	15	20	22	29	41
Total Asia	**268**	**273**	**379**	**442**	**897**	**808**	**764**	**718**	**1 165**	**1 081**	**1 144**	**1 161**
Europe excl. Russian Federation	n.a.	374	371	430	n.a.	97	140	158	n.a.	470	511	588
Total Europe	**642**	**519**	**533**	**650**	**157**	**109**	**154**	**175**	**799**	**628**	**687**	**824**
Caribbean	1	1	1	1	6	4	5	5	7	6	6	6
Central America	3	3	3	4	34	38	42	44	37	42	45	48
North America	591	628	480	527	123	86	82	111	713	714	562	638
Total North and Central America	**595**	**632**	**485**	**532**	**162**	**129**	**129**	**159**	**757**	**761**	**613**	**691**
Total Oceania	**34**	**47**	**57**	**77**	**9**	**13**	**11**	**10**	**43**	**60**	**68**	**87**
Total South America	**110**	**147**	**198**	**248**	**162**	**185**	**162**	**181**	**272**	**332**	**359**	**429**
WORLD	**1 710**	**1 690**	**1 723**	**2 028**	**1 833**	**1 795**	**1 863**	**1 943**	**3 543**	**3 485**	**3 586**	**3 971**

Note: n.a. = not available.

Figure 50. Top ten countries for wood removals, 2018



industrial roundwood in South America). Table 84 shows regional and subregional wood removals for selected years during 1990–2018.

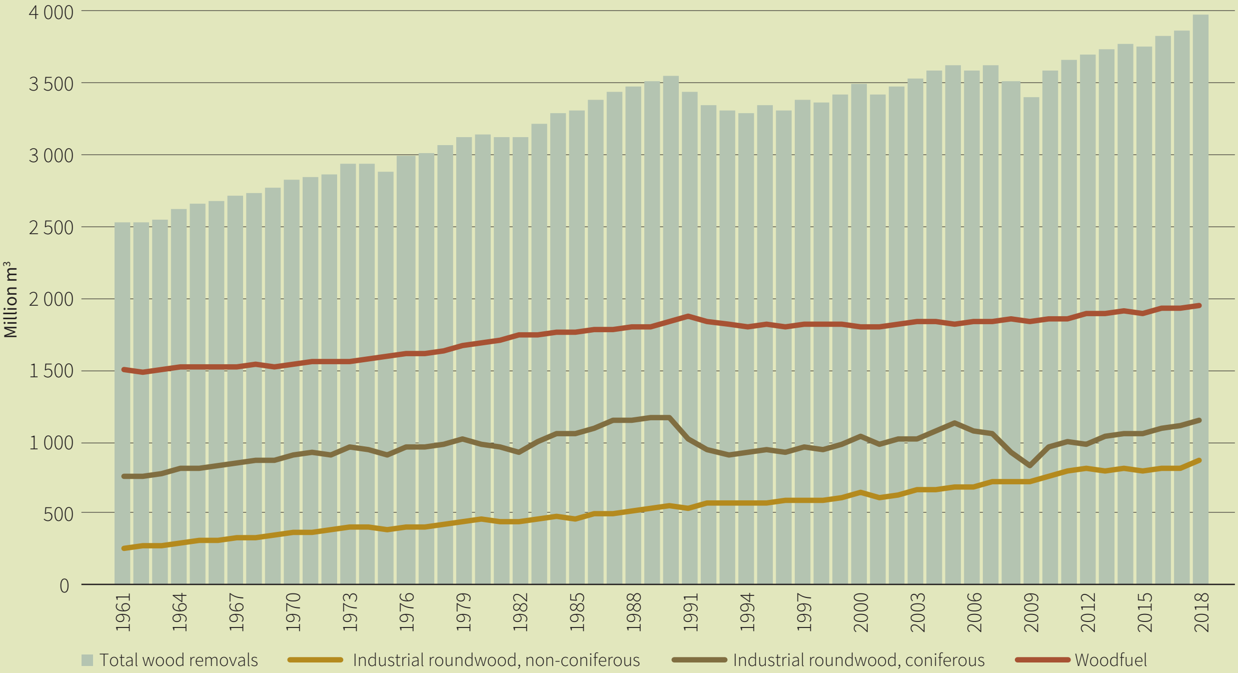
The top ten countries for wood removals, led by the United States of America, accounted for 55 percent of total global removals in 2018 (Figure 50).

Production and trade values for global wood removals and all major wood-based products reached their highest levels since 1947 (when FAO started reporting forest product statistics) in 2018 (FAO, 2019). Global wood removals have fluctuated in response to changes in the production of coniferous industrial roundwood, with significant declines in the early 1990s (during the breakup of the Soviet Union) and 2009 (during the global financial crisis). In contrast, global

(Continued)

Box 9. *(Continued)*

Figure 51. Global trends in wood removals, 1961–2018



removals of non-coniferous industrial roundwood and woodfuel have grown steadily since the 1960s (Figure 51). The proportions of industrial roundwood and woodfuel were roughly the same in 1990 and 2018, although there was variation in this between regions.

In Africa, wood removals increased steadily between 1990 and 2018, from 506 million m³ to 779 million m³. The average annual growth of 2 percent in wood removals in Africa over the period was in line with population growth. Removals increased for both industrial roundwood and woodfuel.

In Asia, wood removals were roughly steady over the period 1990–2018, with the supply of industrial roundwood increasing and woodfuel removals declining correspondingly. This trend was influenced by the rapid development of forest-based industries in the region (i.e. increasing demand for industrial roundwood) and growing living standards (which reduced demand for woodfuel as alternative energy sources became available), particularly in the East Asia and South and Southeast Asia subregions.

A sharp decline in removals in the Russian Federation in the early 1990s – a result of the transition from a centrally planned to a market-based economy – caused an overall reduction in removals in Europe of 21 percent between 1990 and 2000. Thereafter, however, removals in Europe moved back up, reaching a record 824 million m³ in 2018, 3 percent higher than in 1990.

Removals in North and Central America were reasonably steady in the 1990s but declined sharply in the 2000s due to the global financial crisis, which had negative impacts on the housing sector and consequently on wood demand, especially in Canada and the United States of America. Total removals in the region decreased from 761 million m³ in 2000 to 613 million m³ in 2010 before rebounding – in line with economic recovery – to 691 million m³ in 2018. In addition to increasing removals of industrial roundwood, woodfuel removals have been growing in the region to meet increasing export demand for wood pellets.

There has been a steady increase in removals in Oceania in recent decades. Four countries (Australia, New Zealand, Papua New Guinea and the Solomon Islands) account for most of the region's wood removals, which doubled from 43 million m³ in 1990 to 87 million m³ in 2018, due largely to an increased supply of wood from forest plantations in Australia and New Zealand.

Wood removals in South America also grew steadily between 1990 and 2018, from 272 million m³ to 429 million m³. Similarly to Oceania, a growing supply of industrial

(Continued)

Box 9. *(Continued)*

roundwood from forest plantations (especially in Argentina, Brazil, Chile and Uruguay) accounted for most of the increase.

Overall, wood removals are increasing globally as demand for and the consumption of wood products escalates in line with growing populations and incomes. This trend is expected to continue in coming decades.

Not all wood removals originate in forests, and the volume of wood removals in 2018 was less than 1 percent of the forest growing stock.

Most of the long-term growth in wood supply is occurring in countries that have established forest plantations in recent decades (especially in Asia, Latin America and Oceania). Removals in Europe have increased significantly since 2000, particularly in Eastern Europe (including the Russian Federation), where forest industries and demand for wood are expanding rapidly.

11

Discussion

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Building on the experience obtained over more than 70 years (FAO, 2018a), FRA 2020 has achieved several important results, including increased country participation, a reduced reporting burden, stronger capacity-development activities, and improved data availability and quality.

Enhanced country participation

Since 2005, FRAs have been based on country reports prepared by a global network of officially nominated national correspondents, who are responsible for compiling national data for FRA reports and communicating these to the FRA secretariat. For FRA 2020, 187 national correspondents were nominated, an increase of 19 compared with FRA 2015.

Many national correspondents coordinated the inputs of other collaborators in compiling country reports. To help in sharing the reporting workload among national collaborators, data for FRA 2020 were collected via an online platform that enabled national correspondents to invite other contributors. More than 700 contributors had registered by the end of the data-collection process, showing the strong participation of countries and their commitment to the FRA process.

Overall, there was greater participation by countries in FRA 2020 compared with previous assessments. This is illustrated by the number of desk studies prepared by FAO for countries that did not nominate national correspondents or submit reports, which declined from 79 in FRA 2015 to 47 (compiled mainly for small countries and territories and representing less than 0.5 percent of the global forest area) in FRA 2020.

Reduced reporting burden

FRA 2020 reduced the reporting burden on countries through the revision of the reporting content and by excluding data already available via other reporting processes. For the first time since FRA 2000, therefore, there was a substantial reduction in the number of variables for which data were requested. The introduction of the FRA online platform also improved the reporting process and simplified the work of national correspondents. The main features of this platform are easy access to the reporting tables; facilitated data entry; on-the-fly validation checks; tools for data visualization and analysis; and a communication module that allows direct messaging between collaborators and reviewers. FAO's collaboration with Google has enabled the platform to link with Google Earth Engine's functionalities, thereby providing all countries with access to remote sensing data and products and allowing them to use these to generate estimates on, for example, tree cover, burned area, protected-forest area and mangrove area.

Stronger capacity development

Capacity development is a key factor in delivering successful FRAs and ensuring consistency and continuity. At its 23rd and 24th sessions in 2016 and 2018, the FAO Committee on Forestry recommended that FAO "supports the countries in strengthening collection, analysis and dissemination of forest data with a view to support the national SDG indicator framework and country reports", "continues to explore new and innovative tools and techniques to further improve support to Members in collecting, analysing and reporting data on forest and related aspects", and "supports countries with tools, methodologies and capacity-building for generating better information and data on forests' contribution to the SDGs" (FAO, 2016, 2018b).

In responding to these recommendations, FRA 2020 initiated an intensive capacity-development programme in early 2018. The programme had two components – FRA 2020 reporting, and remote sensing. The reporting workshops focused on training national correspondents in the FRA methodology and the new online reporting tool and on supporting countries to complete their reports. One global and nine regional reporting workshops were convened between March and December 2018 involving more than 300 national collaborators.

Box 10. Remote sensing survey, 2020

Since 1990, FAO Global Forest Resources Assessments (FRAs) have complemented the information collected through the country reporting process with remote sensing-based global and regional analyses of the world's forest resources. FRA 2020 continues this tradition through a global remote sensing survey (RSS), with two main objectives: to improve the capacity of countries to use the latest remote sensing data and products to improve estimates of forest area and forest-area change, including for reporting on forest-related indicators for the Sustainable Development Goals; and to derive independent regional and global estimates of forest area and forest-area change.

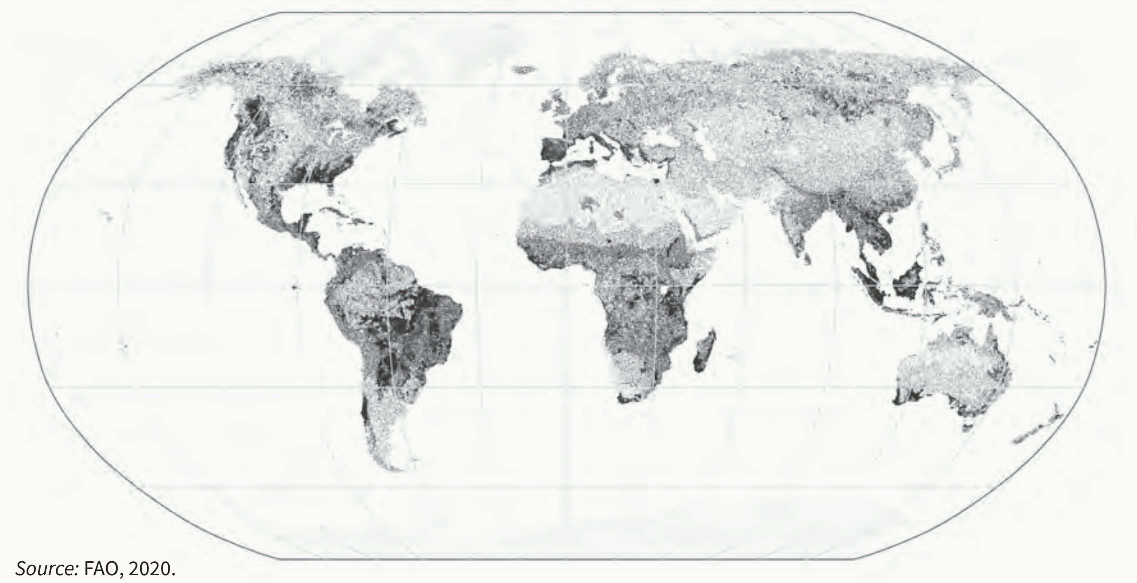
The RSS was designed in collaboration with the Joint Research Centre of the European Commission and a number of international experts. The FRA 2020 RSS builds on the experience of previous surveys, and it also benefits from recent technological developments and improved access to freely available satellite imagery. The resultant methodology is based on the visual interpretation of roughly 430 000 global samples (Figure 52) with the help of satellite images and a new tool, Collect Earth Online,[24] which FAO developed in collaboration with the National Aeronautics and Space Administration of the United States of America and Google.

The RSS has a strong capacity-development component, and data are being collected at national and regional workshops by national experts with thorough knowledge of local vegetation and land uses. Each workshop starts with training on the RSS methodology, followed by a field visit to illustrate and discuss samples that are difficult to assess with remote sensing. The latter parts of workshops focus on data collection for the samples assigned to each country and territory.

The RSS was still under implementation in early 2020. By then, capacity-development workshops had involved participants from 70 countries, trained 384 national experts on the methodology, and obtained 134 700 samples. Data collection will be completed in 2020 and the reporting of results is scheduled for 2021.

More information on the RSS is available at www.fao.org/forest-resources-assessment/remote-sensing/fra-2020-remote-sensing-survey

Figure 52. Sample sites for the remote sensing survey



Source: FAO, 2020.

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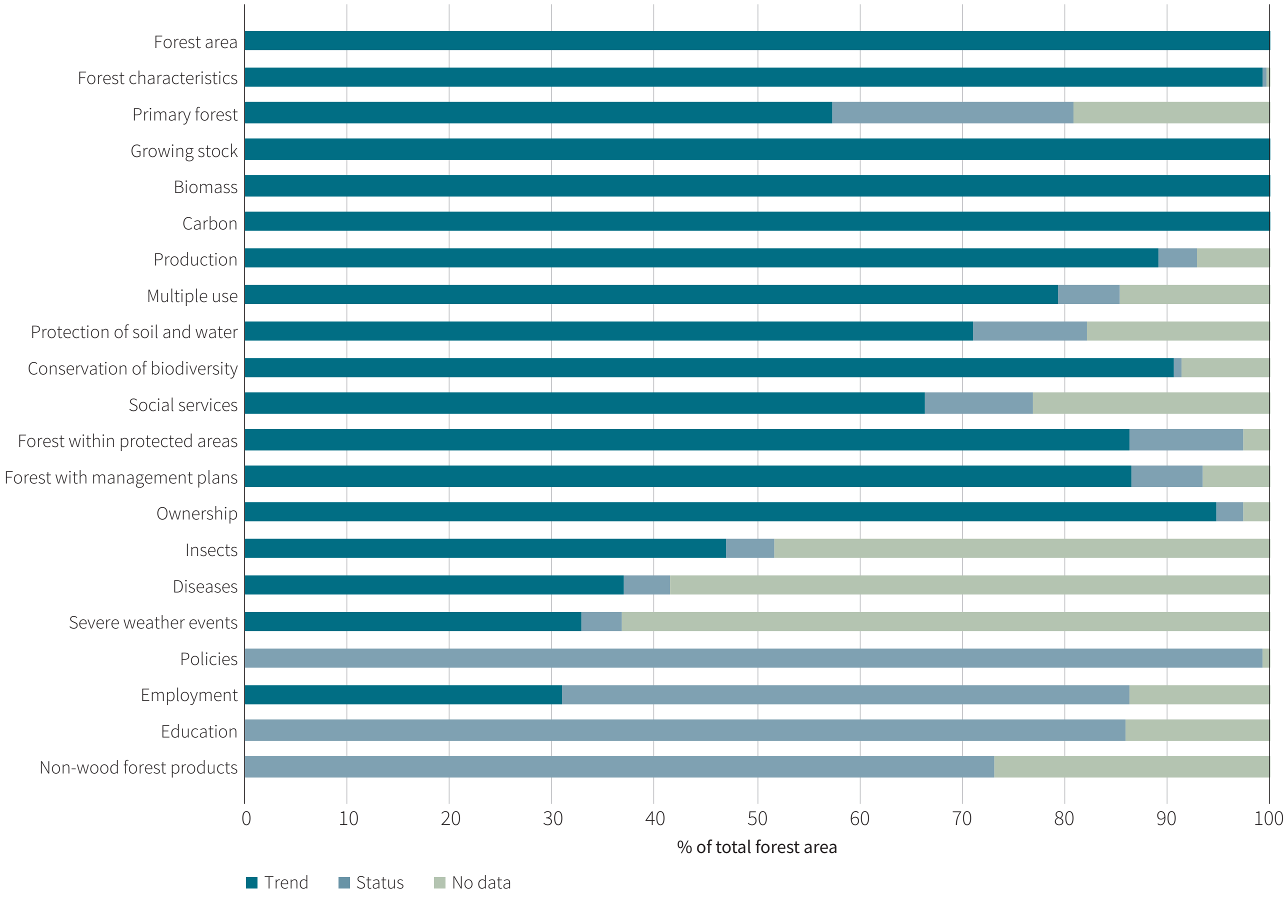
[24] https://collect.earth and www.openforis.org/tools/collect-earth-online.html

FIGURE 53. Data availability for status and trends, 21 main variables



The implementation of the remote sensing capacity-development component started in late 2018 and will continue to the end of 2020. The purpose of this activity is to support countries in using remote sensing to derive information on key forest characteristics and especially forest area and its changes. Sixteen training and analysis workshops were convened in 2018 and 2019, which also contributed to the collection of global remote sensing survey sample data (Box 10).

Improved data availability and quality

FRA 2020 estimates are based on official national statistics derived from field inventories, remote sensing, expert estimates and a combination of these. Many governments in developing countries have invested in the development of self-sustaining national forest monitoring systems in the last decade, often supported by donors and international organizations. FAO has assisted more than 50 national governments since 2009 to develop robust national field-based forest inventories, satellite land-monitoring systems, or both, mostly in the context of the REDD+ Programme. Combined with specific FRA capacity building, these efforts have had a clear, positive impact on the availability and quality of information on forest resources.

The response frequency of countries and territories was generally very good for FRA 2020, and data availability for key variables was high. Of the 21 variables shown in Figure 53, the global forest area represented exceeded 80 percent for 16 variables reporting on status and for ten variables reporting on trends.[25]

The preliminary findings of an assessment of national forest monitoring capacities undertaken by the Center for International Forestry Research and Wageningen University suggest that data quality has improved in FRA 2020 (Box 11).

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[25] In some cases, missing values were gap-filled to obtain complete time series for regional and global estimates. The percentages presented in Figure 53, therefore, may not always be reproduced by aggregating the reported country data.

Box 11. National forest monitoring tier assessment

The Center for International Forestry Research (CIFOR) and Wageningen University assessed national forest monitoring capacities based on country reports submitted for the Global Forest Resources Assessment (FRA) 2020.[26]

The assessment applied a three-class tier system for data quality (Table 85) to a selection of core forest indicators: forest-area status, forest-area trend, growing-stock status, growing-stock trend, biomass, and carbon (Table 86 and Table 87).

TABLE 85. The three-class tier system applied in the assessment of data quality

Class	Variable	Status	Trend
Tier 3	Forest area	Data from 2013 or more recent *Source:* national forest inventories (NFIs), remote sensing surveys or wall-to-wall mapping	Multiple sets of consistent data (in terms of methods and classes), 2013 or more recent, including change estimates from (e.g.) REDD+ forest reference (emission) levels
	Growing stock	Data from 2009 or more recent *Source:* NFIs or remote sensing-based method calibrated with plot data	Multiple consistent NFIs or consistent remote sensing-based estimate
	Biomass	Country-specific expansion factors or allometric equations used for deriving biomass estimates	
	Carbon	Data provided for all five carbon pools	
Tier 2	Forest area	Data older than 2013 *Source:* NFIs, remote sensing surveys or wall-to-wall mapping	Limited consistency between data sources
	Growing stock	Data older than 2009	Multiple NFIs or remote sensing-based estimates but limited consistency and/or older than 2009
	Carbon	Data provided for at least two carbon pools	
Tier 1	Forest area	Other data sources, such as registers or questionnaires, expert assessments	Other data sources, including data from registers or questionnaires, and expert assessments
	Growing stock		
	Biomass	Use of Intergovernmental Panel on Climate Change default factors or generic equations	
	Carbon	Other	

TABLE 86. Number of countries by data-reliability tier, for six indicators

Indicator	FRA 2015				FRA 2020			
	No data	Tier 1	Tier 2	Tier 3	No data	Tier 1	Tier 2	Tier 3
Forest-area status	0	106	64	66	0	54	57	125
Forest-area trend	0	128	64	44	0	71	62	103
Growing-stock status	34	113	44	45	32	72	40	92
Growing-stock trend	36	129	41	30	32	84	60	60
Biomass*	36	149	–	51	30	146	–	60
Carbon	37	–	–	–	30	22	139	45

Note: *Only tiers 1 and 3 were used for biomass.

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[26] The analysis was conducted by Mst Karimon Nesha, Veronique De Sy and Martin Herold (CIFOR/Wageningen University), updating a previous publication by Romijn *et al.* (2015). The full findings of the FRA 2020 analysis will be published in 2020.

Box 11. *(Continued)*

According to the assessment's preliminary findings, more than 90 percent of the estimated forest area in 2020 (status) in FRA 2020 can be categorized as tier 3 (highest reliability of the data sources), with regional variations (Table 88). This is a substantial improvement compared with FRA 2015,[27] with the number of countries reporting tier 3 for forest-area status and trends almost doubling.

Overall, data quality is greatly improved in FRA 2020 compared with FRA 2015 for all the selected indicators; this indicates that many countries produced new data and are considerably improving their monitoring and reporting on forests. Given the improvement in national-level data, regional and global aggregates are also more reliable than previously. On the other hand, most countries are still reporting on biomass using default factors, and there is room for improvement in estimates of trends, particularly in Africa. Note that this analysis examined only a few indicators and does not reflect the situation for many other variables included in FRA 2020 for which data coverage and quality remain poor.

TABLE 87. Proportion of forest area (%) by data-reliability tier, for six indicators

Indicator	FRA 2015				FRA 2020			
	No data	Tier 1	Tier 2	Tier 3	No data	Tier 1	Tier 2	Tier 3
Forest-area status	0	10	31	59	0	2	5	93
Forest-area trend	0	34	42	24	0	2	12	86
Growing-stock status	6	21	40	32	4	5	7	85
Growing-stock trend	15	37	28	19	4	8	27	61
Biomass*	2	55	–	44	<1	24	–	76
Carbon	3	–	–	–	<1	1	38	61

Note: *Only tiers 1 and 3 were used for biomass.

TABLE 88. Proportion of forest area in data-reliability tier 3, by region

Region	%					
	Forest-area status	Forest-area trend	Growing-stock status	Growing-stock trend	Biomass	Carbon
Africa	79	31	69	24	32	1
Asia	92	92	87	80	53	18
Europe	96	96	96	96	94	90
North and Central America	99	98	99	97	99	97
Oceania	97	97	5	5	78	78
South America	95	95	86	14	82	66

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[27] The tier classification system used in FRA 2020 differs slightly to that used in FRA 2015. This is especially significant for forest-area status, where tier 3 status was given to data sources less than ten years old (2004) for FRA 2015 and to data sources from 2013 for FRA 2020. No data on tiers are provided for FRA 2015 because the classes applied in FRA 2020 and FRA 2015 are not comparable. Also, tiers were self-assessed by countries in FRA 2015.

12

Conclusion

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Take-home messages

The global forest area continues to shrink – by an average of 4.7 million ha per year. Globally, the rate of net forest loss has declined since the 1990s, but the latest data show that the pace of this decline slowed in the most recent ten-year period, mainly because the forest area in Asia and Europe expanded less than in the previous decade. Given the current global trend of a shrinking net forest area, it is unlikely that the Global Forest Goal of increasing the world's forest area by 3 percent will be met by 2030.

Halting deforestation remains a challenge. Deforestation continues, albeit at a lower rate than in the past. In the most recent five-year period (2015–2020), deforestation occurred at a rate of 10 million ha per year – 2 million ha less per year than in 2010–2015. At this rate of reduction, however, achieving the SDG 15 target of halting deforestation will take another 25 years.

The deforestation hotspot is now in Africa. More than 90 percent of deforestation is taking place in the tropics. Of the world's six regions, Africa lost the largest area to deforestation in 2010–2020, surpassing South America (the previous leader). Earlier studies have shown that, in tropical and subtropical countries, agricultural expansion accounts for 73 percent of deforestation. In Africa, the continuation of a high rate of deforestation largely reflects the combined impacts of high population growth and the need to sustain livelihoods with small-scale agriculture.

Deforestation has halved in Asia and South America. Deforestation rates in Asia and South America are only about half what they were in the 1990s. In Asia, this is mainly the result of reductions in deforestation in South and Southeast Asia. The decline in deforestation in South America is due largely to a reduction in Brazil, particularly between 2010 and 2015, although some other countries in the region have also curbed deforestation.

Forest management is moving towards sustainability. Long-term management plans exist for more than half the global forest area, and the area of forest with management plans has increased steadily since 2000. Less than 25 percent of the forest area in Africa and South America is under long-term management plans, however; this is cause for concern, given that the existence of such plans is an indicator of the intention to sustainably manage forest resources.

Production is still an important forest management objective. About 30 percent of all forests globally is managed primarily for the production of wood and non-wood forest products – this has been the case since at least 1990. Although the volume of wood removals increased between 1990 and 2020, the number of people employed in forestry and logging declined because of increases (in some regions) in mechanization and labour productivity.

Aichi Biodiversity Target 11 (to protect at least 17 percent of the terrestrial area by 2020) has been exceeded for forest ecosystems as a whole. Globally, 18 percent of the world's forest area, or more than 700 million ha, is in legally established protected areas such as national parks, conservation areas and game reserves (IUCN categories I–IV).

Urgent action is needed to strengthen the positive trend of declining deforestation and to incentivize afforestation, forest restoration and forest conservation, especially in tropical developing countries. Such action is necessary if the world is to meet commitments to halt deforestation, increase forest area, and restore 350 million ha of the world's deforested and degraded land.

Global forest monitoring capacity is greater than ever, but important information gaps remain. Countries need additional support to improve their capacity to collect and report data on a number of key forest indicators. By facilitating the sharing of tools and data sources, FAO's new digital reporting platform is helping address such information gaps.

Next steps

FRA is a country-driven process, which FAO conducts at the request of its member states. Future assessments should continue to build capacity in countries with the aim of enabling continuous forest reporting capacity. This is likely to be increasingly important, with emerging needs for frequent reporting on key variables and indicators – such as the two forest-related SDG indicators, which also have strong linkages with other initiatives such as the New York Declaration on Forests and the Bonn Challenge.

The aim behind several changes to FRA 2020 was to reduce the reporting burden for countries and improve data availability and consistency. This effort should continue as a means to assist national and international policy formulation and decision-making processes. With support from the European Union, the Government of Norway, the Global Environment Facility and potentially other donors, and in collaboration with FAO member states, the FRA Advisory Group, Collaborative Forest Resources Questionnaire partners, and others, FRA will continue to evolve as a dynamic and transparent reporting process that provides easy access to up-to-date, high-quality data.

Annexes

Annex 1. Statistical factsheets

WORLD **236 countries and territories**					
VARIABLE (UNIT)	1990	2000	2010	2020[a]	DATA AVAILABILITY (%)[b]
Forest area (million ha)	4 236	4 158	4 106	4 059	100
Forest area (% of land area)	32.5	31.9	31.5	31.1	100
Growing stock (billion m^3)	560	556	555	557	100[c]
Growing stock (m^3/ha)	132.1	133.8	135.2	137.1	100[c]
Carbon stock in biomass (Gt)	298	296	294	295	100[c]
Carbon stock in biomass (t/ha)	70.3	71.1	71.6	72.6	100[c]
Total carbon stock (Gt)	668	663	662	662	100[c]
Total carbon stock (t/ha)	157.8	159.5	161.3	163.1	100[c]
Naturally regenerating forest (million ha)	4 038	3 919	3 816	3 737	99
Planted forest (million ha)	170	211	262	293	99
… of which plantation forest (million ha)	75	95	116	131	99
Primary forest (million ha)	906	872	837	825	57
Mangroves (million ha)	15.8	15.3	14.9	14.7	99
Forest in protected areas (million ha)	438	500	601	629	86
Forest area with management plans (million ha)	–	1 758	1 856	1 991	87
Designated management objective					
Production (million ha)	1 136	1 113	1 097	1 134	89
Protection of soil and water (million ha)	272	296	325	390	71
Conservation (million ha)	311	347	399	422	91
Social services (million ha)	188	180	180	182	66
Multiple use (million ha)	809	780	751	738	79
Other (million ha)	322	336	312	210	68
VARIABLE (UNIT)	1990	2000	2010	2015	DATA AVAILABILITY (%)[b]
Private ownership (million ha)	828	817	841	857	95
Public ownership (million ha)	2 950	2 918	2 859	2 835	95
Other/unknown ownership (million ha)	446	330	299	284	100

Note:

[a] Data for 2020 comprise countries that reported complete time series of data, and values may differ from those presented in the report based on the analysis of exclusively 2020 data.

[b] Data availability refers to the proportion of total forest area represented by reporting countries.

[c] Missing values have been filled with FAO estimates.

AFRICA

58 countries and territories

VARIABLE (UNIT)	1990	2000	2010	2020[a]	DATA AVAILABILITY (%)[b]
Forest area (million ha)	743	710	676	637	100
Forest area (% of land area)	24.9	23.8	22.6	21.3	100
Growing stock (billion m^3)	88	84	81	76	100[c]
Growing stock (m^3/ha)	118.0	118.8	119.8	120.0	100[c]
Carbon stock in biomass (Gt)	59	56	54	51	100[c]
Carbon stock in biomass (t/ha)	79.1	79.3	79.5	79.4	100[c]
Total carbon stock (Gt)	94	90	86	81	100[c]
Total carbon stock (t/ha)	126.9	126.9	127.1	127.1	100[c]
Naturally regenerating forest (million ha)	734	701	665	625	100
Planted forest (million ha)	8.5	8.9	10.6	11.4	100
… of which plantation forest (million ha)	6.0	6.2	7.1	7.7	100
Primary forest (million ha)	143	137	131	123	51
Mangroves (million ha)	3.40	3.33	3.26	3.24	95
Forest in protected areas (million ha)	124	125	129	131	72
Forest area with management plans (million ha)	–	79	91	118	64
Designated management objective					
Production (million ha)	109	104	91	91	79
Protection of soil and water (million ha)	43	41	38	36	52
Conservation (million ha)	95	97	104	107	69
Social services (million ha)	2.0	1.8	1.7	3.0	28
Multiple use (million ha)	95	88	82	73	37
Other (million ha)	0	0	0	0	23

VARIABLE (UNIT)	1990	2000	2010	2015	DATA AVAILABILITY (%)[b]
Private ownership (million ha)	46	39	37	36	93
Public ownership (million ha)	526	508	481	463	93
Other/unknown ownership (million ha)	166	158	154	157	100

Note:

[a] Data for 2020 comprise countries that reported complete time series of data, and values may differ from those presented in the report based on the analysis of exclusively 2020 data.

[b] Data availability refers to the proportion of total forest area represented by reporting countries.

[c] Missing values have been filled with FAO estimates.

ASIA

48 countries and territories

VARIABLE (UNIT)	1990	2000	2010	2020[a]	DATA AVAILABILITY (%)[b]
Forest area (million ha)	585	587	611	623	100
Forest area (% of land area)	18.8	18.9	19.7	20.0	100
Growing stock (billion m^3)	52	54	58	63	100[c]
Growing stock (m^3/ha)	88.1	92.4	95.3	100.4	100[c]
Carbon stock in biomass (Gt)	34	35	36	38	100[c]
Carbon stock in biomass (t/ha)	58.2	59.7	59.2	60.3	100[c]
Total carbon stock (Gt)	77	79	82	85	100[c]
Total carbon stock (t/ha)	131.7	133.7	134.1	136.1	100
Naturally regenerating forest (million ha)	511	493	491	487	100
Planted forest (million ha)	74	94	120	135	100
… of which plantation forest (million ha)	50	62	72	79	100
Primary forest (million ha)	100	93	86	86	90
Mangroves (million ha)	6.33	6.32	5.93	5.55	96
Forest in protected areas (million ha)	85	102	128	135	85
Forest area with management plans (million ha)	–	280	314	353	89
Designated management objective					
Production (million ha)	202	207	188	190	97
Protection of soil and water (million ha)	103	117	134	132	96
Conservation (million ha)	63	67	81	89	98
Social services (million ha)	3.7	3.5	4.7	5.7	92
Multiple use (million ha)	95	109	120	134	94
Other (million ha)	28	28	29	29	89

VARIABLE (UNIT)	1990	2000	2010	2015	DATA AVAILABILITY (%)[b]
Private ownership (million ha)	64	73	119	132	98
Public ownership (million ha)	490	485	463	464	98
Other/unknown ownership (million ha)	32	25	22	10	100

Note:

[a] Data for 2020 comprise countries that reported complete time series of data, and values may differ from those presented in the report based on the analysis of exclusively 2020 data.

[b] Data availability refers to the proportion of total forest area represented by reporting countries.

[c] Missing values have been filled with FAO estimates.

EUROPE

50 countries and territories

VARIABLE (UNIT)	1990	2000	2010	2020[a]	DATA AVAILABILITY (%)[b]
Forest area (million ha)	994	1 002	1 014	1 017	100
Forest area (% of land area)	44.9	45.3	45.8	46.0	100
Growing stock (billion m^3)	104	108	113	116	100[c]
Growing stock (m^3/ha)	104.9	107.8	111.5	114.2	100[c]
Carbon stock in biomass (Gt)	45	48	51	55	100[c]
Carbon stock in biomass (t/ha)	45.4	47.5	50.5	53.6	100[c]
Total carbon stock (Gt)	159	162	168	172	100[c]
Total carbon stock (t/ha)	159.7	162.1	165.8	169.5	100[c]
Naturally regenerating forest (million ha)	913	913	914	915	97
Planted forest (million ha)	54	62	72	74	97
… of which plantation forest (million ha)	2.9	3.8	4.2	4.0	97
Primary forest (million ha)	0.85	0.99	1.32	1.41	44
Mangroves (million ha)	0	0	0	0	100
Forest in protected areas (million ha)	18	29	41	46	94
Forest area with management plans (million ha)	–	934	938	942	96
Designated management objective					
Production (million ha)	510	473	482	514	95
Protection of soil and water (million ha)	76	90	106	171	94
Conservation (million ha)	18	28	35	39	97
Social services (million ha)	24	17	18	19	96
Multiple use (million ha)	38	38	41	43	94
Other (million ha)	277	303	279	178	96

VARIABLE (UNIT)	1990	2000	2010	2015	DATA AVAILABILITY (%)[b]
Private ownership (million ha)	74	83	90	92	97
Public ownership (million ha)	894	890	895	895	97
Other/unknown ownership (million ha)	18	20	8	28	100

Note:

[a] Data for 2020 comprise countries that reported complete time series of data, and values may differ from those presented in the report based on the analysis of exclusively 2020 data.

[b] Data availability refers to the proportion of total forest area represented by reporting countries.

[c] Missing values have been filled with FAO estimates.

NORTH AND CENTRAL AMERICA

41 countries and territories

VARIABLE (UNIT)	1990	2000	2010	2020[a]	DATA AVAILABILITY (%)[b]
Forest area (million ha)	755	752	754	753	100
Forest area (% of land area)	35.4	35.3	35.4	35.3	100
Growing stock (billion m^3)	90	92	93	95	100[c]
Growing stock (m^3/ha)	119.6	122.0	123.6	126.3	100[c]
Carbon stock in biomass (Gt)	39	40	41	42	100[c]
Carbon stock in biomass (t/ha)	52.2	53.7	54.2	55.3	100[c]
Total carbon stock (Gt)	143	144	146	146	100[c]
Total carbon stock (t/ha)	189.6	191.6	193.0	194.1	100[c]
Naturally regenerating forest (million ha)	732	720	714	706	100
Planted forest (million ha)	23	33	41	47	100
… of which plantation forest (million ha)	6.6	9.3	13.5	15.2	100
Primary forest (million ha)	317	314	314	313	97
Mangroves (million ha)	2.43	2.44	2.45	2.55	100
Forest in protected areas (million ha)	42	51	71	73	98
Forest area with management plans (million ha)	–	387	401	432	97
Designated management objective					
Production (million ha)	207	217	225	230	88
Protection of soil and water (million ha)	16	16	17	17	47
Conservation (million ha)	46	53	69	74	97
Social services (million ha)	15	15	15	15	47
Multiple use (million ha)	260	260	258	254	88
Other (million ha)	0.9	1.0	0.9	0.9	47

VARIABLE (UNIT)	1990	2000	2010	2015	DATA AVAILABILITY (%)[b]
Private ownership (million ha)	264	263	262	264	97
Public ownership (million ha)	450	450	455	455	97
Other/unknown ownership (million ha)	41	39	36	32	100

Note:

[a] Data for 2020 comprise countries that reported complete time series of data, and values may differ from those presented in the report based on the analysis of exclusively 2020 data.

[b] Data availability refers to the proportion of total forest area represented by reporting countries.

[c] Missing values have been filled with FAO estimates.

OCEANIA

25 countries and territories

VARIABLE (UNIT)	1990	2000	2010	2020[a]	DATA AVAILABILITY (%)[b]
Forest area (million ha)	185	183	181	185	100
Forest area (% of land area)	21.8	21.6	21.3	21.8	100
Growing stock (billion m^3)	19	19	19	19	100[c]
Growing stock (m^3/ha)	101.2	102.0	103.8	101.8	100[c]
Carbon stock in biomass (Gt)	14	14	14	14	100[c]
Carbon stock in biomass (t/ha)	75.4	75.7	76.6	74.9	100[c]
Total carbon stock (Gt)	33	33	33	33	100[c]
Total carbon stock (t/ha)	180.2	180.6	182.7	178.5	100[c]
Naturally regenerating forest (million ha)	182	179	176	180	100
Planted forest (million ha)	2.8	3.8	4.5	4.8	100
… of which plantation forest (million ha)	2.8	3.8	4.3	4.4	100
Primary forest (million ha)	3	3	3	3	7
Mangroves (million ha)	1.45	1.15	1.31	1.26	100
Forest in protected areas (million ha)	18	21	26	28	78
Forest area with management plans (million ha)	–	12	12	12	25
Designated management objective					
Production (million ha)	8.0	8.7	9.3	9.2	98
Protection of soil and water (million ha)	1.2	1.2	1.2	1.2	26
Conservation (million ha)	20	24	29	31	98
Social services (million ha)	0	0	0	0	5
Multiple use (million ha)	13	10	12	12	97
Other (million ha)	0	0	0	0	78

VARIABLE (UNIT)	1990	2000	2010	2015	DATA AVAILABILITY (%)[b]
Private ownership (million ha)	78	74	77	84	98
Public ownership (million ha)	103	104	99	95	98
Other/unknown ownership (million ha)	4.7	5.8	4.0	1.2	100

Note:

[a] Data for 2020 comprise countries that reported complete time series of data, and values may differ from those presented in the report based on the analysis of exclusively 2020 data.

[b] Data availability refers to the proportion of total forest area represented by reporting countries.

[c] Missing values have been filled with FAO estimates.

SOUTH AMERICA

14 countries and territories

VARIABLE (UNIT)	1990	2000	2010	2020[a]	DATA AVAILABILITY (%)[b]
Forest area (million ha)	974	923	870	844	100
Forest area (% of land area)	55.8	52.8	49.8	48.3	100
Growing stock (billion m^3)	207	199	191	187	100[c]
Growing stock (m^3/ha)	212.8	215.7	219.2	222.1	100[c]
Carbon stock in biomass (Gt)	106	102	98	96	100[c]
Carbon stock in biomass (t/ha)	109.4	111.0	112.9	114.1	100[c]
Total carbon stock (Gt)	162	155	148	145	100[c]
Total carbon stock (t/ha)	166.1	167.9	170.0	171.6	100[c]
Naturally regenerating forest (million ha)	967	913	855	824	100
Planted forest (million ha)	7.0	9.4	14.9	20.2	100
… of which plantation forest (million ha)	7.0	9.3	14.7	20.1	100
Primary forest (million ha)	342	325	302	299	72
Mangroves (million ha)	2.15	2.05	1.98	2.12	100
Forest in protected areas (million ha)	150	172	206	216	80
Forest area with management plans (million ha)	–	65	99	134	95
Designated management objective					
Production (million ha)	99	102	102	100	83
Protection of soil and water (million ha)	33	31	30	34	71
Conservation (million ha)	68	78	82	83	86
Social services (million ha)	144	143	141	140	71
Multiple use (million ha)	309	275	238	223	71
Other (million ha)	16	3.0	3.0	2.9	71
VARIABLE (UNIT)	1990	2000	2010	2015	DATA AVAILABILITY (%)[b]
Private ownership (million ha)	302	286	255	248	87
Public ownership (million ha)	488	480	466	462	87
Other/unknown ownership (million ha)	184	82	75	55	100

Note:

[a] Data for 2020 comprise countries that reported complete time series of data, and values may differ from those presented in the report based on the analysis of exclusively 2020 data.

[b] Data availability refers to the proportion of total forest area represented by reporting countries.

[c] Missing values have been filled with FAO estimates.

Annex 2. Global tables

TABLE A1. **Extent of forest, 1990–2020**

Country/territory	Forest area (1 000 ha)				Net annual change					
	1990	2000	2010	2020	1990–2000		2000–2010		2010–2020	
					1 000 ha/yr	%	1 000 ha/yr	%	1 000 ha/yr	%
Afghanistan	1 208	1 208	1 208	1 208	0.0	0.00	0.0	0.00	0.0	0.00
Albania	789	769	782	789	-2.0	-0.25	1.3	0.16	0.7	0.09
Algeria	1 667	1 579	1 918	1 949	-8.8	-0.54	33.9	1.96	3.1	0.16
American Samoa	18	18	17	17	n.s.	-0.19	n.s.	-0.17	n.s.	-0.17
Andorra	16	16	16	16	0.0	0.00	0.0	0.00	0.0	0.00
Angola	79 263	77 709	72 158	66 607	-155.4	-0.20	-555.1	-0.74	-555.1	-0.80
Anguilla	6	6	6	6	0.0	0.00	0.0	0.00	0.0	0.00
Antigua and Barbuda	10	9	9	8	-0.1	-0.67	-0.1	-0.73	-0.1	-0.78
Argentina	35 204	33 378	30 214	28 573	-182.6	-0.53	-316.4	-0.99	-164.1	-0.56
Armenia	335	333	331	328	-0.2	-0.06	-0.2	-0.06	-0.2	-0.06
Aruba	n.s.	n.s.	n.s.	n.s.	0.0	0.00	0.0	0.00	0.0	0.00
Australia	133 882	131 814	129 546	134 005	-206.8	-0.16	-226.8	-0.17	445.9	0.34
Austria	3 776	3 838	3 863	3 899	6.2	0.16	2.5	0.07	3.6	0.09
Azerbaijan	945	987	1 032	1 132	4.2	0.44	4.5	0.45	9.9	0.92
Bahamas	510	510	510	510	0.0	0.00	0.0	0.00	0.0	0.00
Bahrain	n.s.	n.s.	1	1	n.s.	5.34	n.s.	3.46	n.s.	3.02
Bangladesh	1 920	1 920	1 888	1 883	n.s.	n.s.	-3.2	-0.17	-0.5	-0.03
Barbados	6	6	6	6	0.0	0.00	0.0	0.00	0.0	0.00
Belarus	7 780	8 273	8 630	8 768	49.3	0.62	35.7	0.42	13.8	0.16
Belgium	677	667	690	689	-1.0	-0.15	2.3	0.33	-0.1	-0.01
Belize	1 600	1 459	1 391	1 277	-14.1	-0.92	-6.8	-0.48	-11.4	-0.85
Benin	4 835	4 135	3 635	3 135	-70.0	-1.55	-50.0	-1.28	-50.0	-1.47
Bermuda	1	1	1	1	0.0	0.00	0.0	0.00	0.0	0.00
Bhutan	2 507	2 606	2 705	2 725	9.9	0.39	9.9	0.37	2.0	0.07
Bolivia (Plurinational State of)	57 805	55 101	53 086	50 834	-270.3	-0.48	-201.5	-0.37	-225.2	-0.43
Bonaire, Sint Eustatius and Saba	2	2	2	2	0.0	0.00	0.0	0.00	0.0	0.00
Bosnia and Herzegovina	2 210	2 112	2 103	2 188	-9.8	-0.45	-0.9	-0.04	8.5	0.40
Botswana	18 804	17 621	16 438	15 255	-118.3	-0.65	-118.3	-0.69	-118.3	-0.74
Brazil	588 898	551 089	511 581	496 620	-3 780.9	-0.66	-3 950.8	-0.74	-1 496.1	-0.30
British Virgin Islands	4	4	4	4	n.s.	-0.11	n.s.	-0.08	n.s.	-0.06
Brunei Darussalam	413	397	380	380	-1.6	-0.39	-1.7	-0.44	0.0	0.00
Bulgaria	3 327	3 375	3 737	3 893	4.8	0.14	36.2	1.02	15.6	0.41
Burkina Faso	7 717	7 217	6 717	6 216	-50.0	-0.67	-50.0	-0.72	-50.0	-0.77

(Continued)

TABLE A1. *(Continued)*

Country/territory	Forest area (1 000 ha)				Net annual change					
	1990	2000	2010	2020	1990–2000		2000–2010		2010–2020	
					1 000 ha/yr	%	1 000 ha/yr	%	1 000 ha/yr	%
Burundi	276	194	194	280	-8.3	-3.48	0.0	0.00	8.6	3.73
Cabo Verde	15	40	43	46	2.4	9.95	0.3	0.73	0.3	0.68
Cambodia	11 005	10 781	10 589	8 068	-22.4	-0.21	-19.2	-0.18	-252.1	-2.68
Cameroon	22 500	21 597	20 900	20 340	-90.3	-0.41	-69.7	-0.33	-56.0	-0.27
Canada	348 273	347 802	347 322	346 928	-47.1	-0.01	-48.0	-0.01	-39.4	-0.01
Cayman Islands	13	13	13	13	n.s.	-0.15	n.s.	-0.16	0.0	0.00
Central African Republic	23 203	22 903	22 603	22 303	-30.0	-0.13	-30.0	-0.13	-30.0	-0.13
Chad	6 730	6 353	5 530	4 313	-37.7	-0.57	-82.3	-1.38	-121.7	-2.45
Chile	15 246	15 817	16 725	18 211	57.1	0.37	90.8	0.56	148.5	0.85
China	157 141	177 001	200 610	219 978	1 986.0	1.20	2 361.0	1.26	1 936.8	0.93
Colombia	64 958	62 736	60 808	59 142	-222.3	-0.35	-192.8	-0.31	-166.6	-0.28
Comoros	46	42	37	33	-0.4	-0.99	-0.4	-1.10	-0.4	-1.24
Congo	22 315	22 195	22 075	21 946	-12.0	-0.05	-12.0	-0.05	-12.9	-0.06
Cook Islands	15	16	16	16	0.1	0.43	n.s.	0.01	0.0	0.00
Costa Rica	2 907	2 857	2 871	3 035	-5.0	-0.17	1.4	0.05	16.4	0.56
Côte d'Ivoire	7 851	5 094	3 966	2 837	-275.6	-4.23	-112.9	-2.47	-112.9	-3.29
Croatia	1 850	1 885	1 920	1 939	3.5	0.19	3.5	0.18	1.9	0.10
Cuba	2 058	2 435	2 932	3 242	37.7	1.70	49.7	1.87	31.0	1.01
Curaçao	n.s.	n.s.	n.s.	n.s.	0.0	0.00	0.0	0.00	0.0	0.00
Cyprus	161	172	173	173	1.1	0.63	0.1	0.07	n.s.	-0.02
Czechia	2 629	2 637	2 657	2 677	0.8	0.03	2.0	0.08	2.0	0.07
Democratic People's Republic of Korea	6 912	6 455	6 242	6 030	-45.7	-0.68	-21.2	-0.33	-21.2	-0.35
Democratic Republic of the Congo	150 629	143 899	137 169	126 155	-673.0	-0.46	-673.0	-0.48	-1 101.4	-0.83
Denmark	531	572	586	628	4.0	0.73	1.5	0.26	4.2	0.69
Djibouti	6	6	6	6	0.0	0.00	0.0	0.00	n.s.	0.35
Dominica	50	48	48	48	-0.2	-0.50	0.0	0.00	0.0	0.00
Dominican Republic	1 595	1 972	2 073	2 144	37.8	2.15	10.1	0.50	7.1	0.34
Ecuador	14 632	13 731	13 028	12 498	-90.2	-0.63	-70.2	-0.52	-53.0	-0.41
Egypt	44	59	66	45	1.5	3.06	0.6	1.04	-2.1	-3.71
El Salvador	719	674	629	584	-4.5	-0.64	-4.5	-0.69	-4.5	-0.74
Equatorial Guinea	2 699	2 616	2 532	2 448	-8.4	-0.31	-8.4	-0.32	-8.4	-0.34
Eritrea	1 150	1 118	1 087	1 055	-3.2	-0.28	-3.2	-0.29	-3.2	-0.29
Estonia	2 206	2 239	2 336	2 438	3.3	0.15	9.7	0.43	10.2	0.43
Eswatini	461	473	485	498	1.2	0.26	1.2	0.25	1.2	0.25
Ethiopia	19 259	18 529	17 799	17 069	-73.0	-0.39	-73.0	-0.40	-73.0	-0.42
Falkland Islands (Malvinas)*	0	0	0	0	0.0		0.0		0.0	
Faroe Islands	n.s.	n.s.	n.s.	n.s.	0.0	0.00	0.0	0.00	0.0	0.00
Fiji	940	1 006	1 073	1 140	6.7	0.69	6.7	0.64	6.7	0.61

(Continued)

TABLE A1. *(Continued)*

Country/territory	Forest area (1 000 ha)				Net annual change					
	1990	2000	2010	2020	1990–2000		2000–2010		2010–2020	
					1 000 ha/yr	%	1 000 ha/yr	%	1 000 ha/yr	%
Finland	21 875	22 446	22 242	22 409	57.0	0.26	-20.4	-0.09	16.7	0.07
France	14 436	15 288	16 419	17 253	85.2	0.58	113.1	0.72	83.4	0.50
French Guiana	8 125	8 079	8 037	8 003	-4.6	-0.06	-4.3	-0.05	-3.4	-0.04
French Polynesia	144	149	149	149	0.4	0.28	0.1	0.06	0.0	0.00
Gabon	23 762	23 700	23 649	23 531	-6.2	-0.03	-5.1	-0.02	-11.9	-0.05
Gambia	415	357	300	243	-5.7	-1.48	-5.7	-1.73	-5.7	-2.10
Georgia	2 752	2 761	2 822	2 822	0.8	0.03	6.2	0.22	0.0	0.00
Germany	11 300	11 354	11 409	11 419	5.4	0.05	5.5	0.05	1.0	0.01
Ghana	9 924	8 849	7 943	7 986	-107.6	-1.14	-90.6	-1.07	4.3	0.05
Gibraltar	0	0	0	0	0.0		0.0		0.0	
Greece	3 299	3 600	3 902	3 902	30.2	0.88	30.2	0.81	n.s.	n.s.
Greenland	n.s.	n.s.	n.s.	n.s.	0.0	0.00	0.0	0.00	0.0	0.00
Grenada	18	18	18	18	0.0	0.00	0.0	0.00	0.0	0.00
Guadeloupe	73	72	72	72	-0.1	-0.12	-0.1	-0.10	n.s.	0.05
Guam	24	24	24	28	0.0	0.00	0.0	0.00	0.4	1.55
Guatemala	4 781	4 209	3 723	3 528	-57.2	-1.27	-48.7	-1.22	-19.5	-0.54
Guernsey	n.s.	n.s.	n.s.	n.s.	0.0	0.00	n.s.	6.21	0.0	0.00
Guinea	7 276	6 929	6 569	6 189	-34.7	-0.49	-36.0	-0.53	-38.0	-0.59
Guinea-Bissau	2 233	2 149	2 064	1 980	-8.4	-0.38	-8.4	-0.40	-8.4	-0.42
Guyana	18 602	18 564	18 520	18 415	-3.8	-0.02	-4.4	-0.02	-10.4	-0.06
Haiti	383	381	378	347	-0.2	-0.06	-0.2	-0.06	-3.1	-0.85
Holy See	0	0	0	0	0.0		0.0		0.0	
Honduras	6 988	6 778	6 575	6 359	-21.0	-0.30	-20.3	-0.30	-21.6	-0.33
Hungary	1 814	1 921	2 046	2 053	10.7	0.58	12.5	0.63	0.7	0.03
Iceland	17	30	45	51	1.3	5.74	1.5	4.12	0.7	1.40
India	63 938	67 591	69 496	72 160	365.3	0.56	190.5	0.28	266.4	0.38
Indonesia	118 545	101 280	99 659	92 133	-1 726.5	-1.56	-162.1	-0.16	-752.6	-0.78
Iran (Islamic Republic of)	9 076	9 326	10 692	10 752	25.0	0.27	136.6	1.38	6.0	0.06
Iraq	804	818	825	825	1.4	0.17	0.7	0.09	0.0	0.00
Ireland	462	630	720	782	16.9	3.16	9.0	1.34	6.2	0.82
Isle of Man	3	3	3	3	0.0	0.00	0.0	0.00	0.0	0.00
Israel	132	153	154	140	2.1	1.49	0.1	0.07	-1.4	-0.95
Italy	7 590	8 369	9 028	9 566	78.0	0.98	65.9	0.76	53.8	0.58
Jamaica	521	521	558	597	n.s.	-0.01	3.7	0.70	3.8	0.67
Japan	24 950	24 876	24 966	24 935	-7.4	-0.03	9.0	0.04	-3.1	-0.01
Jersey	1	1	1	1	0.0	0.00	0.0	0.00	0.0	0.00
Jordan	98	98	98	98	0.0	0.00	0.0	0.00	0.0	0.00
Kazakhstan	3 162	3 157	3 082	3 455	-0.5	-0.02	-7.5	-0.24	37.3	1.15
Kenya	3 859	3 961	3 616	3 611	10.3	0.26	-34.5	-0.91	-0.5	-0.01
Kiribati	1	1	1	1	0.0	0.00	0.0	0.00	0.0	0.00

(Continued)

TABLE A1. *(Continued)*

Country/territory	Forest area (1 000 ha)				Net annual change					
	1990	2000	2010	2020	1990–2000		2000–2010		2010–2020	
					1 000 ha/yr	%	1 000 ha/yr	%	1 000 ha/yr	%
Kuwait	3	5	6	6	0.1	3.46	0.1	2.57	0.0	0.00
Kyrgyzstan	1 136	1 181	1 230	1 315	4.4	0.38	4.9	0.41	8.6	0.68
Lao People's Democratic Republic	17 843	17 425	16 941	16 596	-41.8	-0.24	-48.5	-0.28	-34.5	-0.21
Latvia	3 173	3 241	3 372	3 411	6.8	0.21	13.1	0.40	3.9	0.11
Lebanon	140	138	137	143	-0.2	-0.11	-0.1	-0.06	0.6	0.43
Lesotho	35	35	35	35	0.0	0.00	0.0	0.00	0.0	0.00
Liberia	8 525	8 223	7 920	7 617	-30.3	-0.36	-30.3	-0.37	-30.3	-0.39
Libya	217	217	217	217	0.0	0.00	0.0	0.00	0.0	0.00
Liechtenstein	7	7	7	7	n.s.	0.30	n.s.	n.s.	n.s.	n.s.
Lithuania	1 945	2 020	2 170	2 201	7.5	0.38	15.0	0.72	3.1	0.14
Luxembourg	86	87	89	89	0.1	0.10	0.2	0.23	0.0	0.00
Madagascar	13 693	13 031	12 562	12 430	-66.3	-0.49	-46.9	-0.37	-13.2	-0.11
Malawi	3 502	3 082	2 662	2 242	-42.0	-1.27	-42.0	-1.45	-42.0	-1.70
Malaysia	20 619	19 691	18 948	19 114	-92.7	-0.46	-74.4	-0.38	16.6	0.09
Maldives	1	1	1	1	0.0	0.00	0.0	0.00	0.0	0.00
Mali	13 296	13 296	13 296	13 296	0.0	0.00	0.0	0.00	0.0	0.00
Malta	n.s.	n.s.	n.s.	n.s.	0.0	0.00	0.0	0.00	n.s.	2.77
Marshall Islands	9	9	9	9	0.0	0.00	0.0	0.00	0.0	0.00
Martinique	48	49	50	52	0.1	0.19	0.2	0.31	0.2	0.39
Mauritania	476	422	367	313	-5.4	-1.21	-5.4	-1.37	-5.4	-1.59
Mauritius	41	42	38	39	0.1	0.21	-0.4	-0.88	n.s.	0.10
Mayotte	19	16	14	14	-0.3	-1.96	-0.1	-0.83	-0.1	-0.37
Mexico	70 592	68 381	66 943	65 692	-221.0	-0.32	-143.8	-0.21	-125.1	-0.19
Micronesia (Federated States of)	64	64	64	64	n.s.	0.04	n.s.	0.04	n.s.	0.05
Monaco	0	0	0	0	0.0		0.0		0.0	
Mongolia	14 352	14 264	14 184	14 173	-8.8	-0.06	-8.0	-0.06	-1.1	-0.01
Montenegro	626	626	827	827	0.0	0.00	20.1	2.82	0.0	0.00
Montserrat	4	3	3	3	-0.1	-3.31	0.0	0.00	0.0	0.00
Morocco	5 485	5 507	5 675	5 742	2.1	0.04	16.8	0.30	6.8	0.12
Mozambique	43 378	41 188	38 972	36 744	-219.0	-0.52	-221.6	-0.55	-222.8	-0.59
Myanmar	39 218	34 868	31 441	28 544	-435.0	-1.17	-342.7	-1.03	-289.7	-0.96
Namibia	8 769	8 059	7 349	6 639	-71.0	-0.84	-71.0	-0.92	-71.0	-1.01
Nauru	0	0	0	0	0.0		0.0		0.0	
Nepal	5 672	5 781	5 962	5 962	10.9	0.19	18.1	0.31	0.0	0.00
Netherlands	345	360	373	370	1.4	0.40	1.4	0.38	-0.4	-0.11
New Caledonia	831	838	839	838	0.7	0.08	0.1	0.01	-0.1	-0.01
New Zealand	9 372	9 850	9 848	9 893	47.8	0.50	-0.2	n.s.	4.4	0.05
Nicaragua	6 399	5 399	4 188	3 408	-100.0	-1.68	-121.1	-2.51	-78.1	-2.04

(Continued)

TABLE A1. *(Continued)*

Country/territory	Forest area (1 000 ha)				Net annual change					
	1990	2000	2010	2020	1990–2000		2000–2010		2010–2020	
					1 000 ha/yr	%	1 000 ha/yr	%	1 000 ha/yr	%
Niger	1 945	1 328	1 204	1 080	-61.7	-3.74	-12.4	-0.98	-12.4	-1.08
Nigeria	26 526	24 893	23 260	21 627	-163.3	-0.63	-163.3	-0.68	-163.3	-0.73
Niue	19	19	19	19	n.s.	-0.05	n.s.	-0.03	n.s.	0.05
Norfolk Island	n.s.	n.s.	n.s.	n.s.	0.0	0.00	0.0	0.00	0.0	0.00
North Macedonia	912	958	960	1 001	4.6	0.49	0.3	0.03	4.1	0.42
Northern Mariana Islands	34	32	30	24	-0.2	-0.50	-0.2	-0.53	-0.6	-2.16
Norway	12 132	12 113	12 102	12 180	-1.9	-0.02	-1.1	-0.01	7.8	0.06
Oman	3	3	3	3	0.0	0.00	0.0	0.00	-0.1	-1.81
Pakistan	4 987	4 511	4 094	3 726	-47.6	-1.00	-41.8	-0.97	-36.8	-0.94
Palau	38	40	41	41	0.1	0.37	0.1	0.24	0.1	0.21
Palestine	9	9	10	10	0.0	0.00	0.1	0.92	n.s.	0.19
Panama	4 607	4 442	4 328	4 214	-16.5	-0.36	-11.4	-0.26	-11.4	-0.27
Papua New Guinea	36 400	36 278	36 179	35 856	-12.2	-0.03	-9.9	-0.03	-32.3	-0.09
Paraguay	25 546	22 992	19 570	16 102	-255.4	-1.05	-342.1	-1.60	-346.8	-1.93
Peru	76 449	75 298	74 050	72 330	-115.1	-0.15	-124.8	-0.17	-171.9	-0.23
Philippines	7 779	7 309	6 840	7 189	-47.0	-0.62	-47.0	-0.66	34.9	0.50
Pitcairn Islands	4	4	4	4	0.0	0.00	0.0	0.00	0.0	0.00
Poland	8 882	9 059	9 329	9 483	17.7	0.20	27.0	0.29	15.4	0.16
Portugal	3 399	3 281	3 252	3 312	-11.8	-0.35	-2.9	-0.09	6.0	0.18
Puerto Rico	320	429	491	496	10.9	2.97	6.2	1.36	0.5	0.10
Qatar	0	0	0	0	0.0		0.0		0.0	
Republic of Korea	6 551	6 476	6 387	6 287	-7.5	-0.12	-8.9	-0.14	-10.0	-0.16
Republic of Moldova	325	344	375	387	1.9	0.57	3.0	0.84	1.2	0.32
Réunion	88	91	94	98	0.3	0.34	0.3	0.33	0.4	0.46
Romania	6 371	6 366	6 515	6 929	-0.5	-0.01	14.9	0.23	41.4	0.62
Russian Federation	808 950	809 269	815 136	815 312	31.9	n.s.	586.7	0.07	17.6	n.s.
Rwanda	317	287	265	276	-3.0	-0.99	-2.2	-0.79	1.1	0.41
Saint Barthélemy	n.s.	n.s.	n.s.	n.s.	0.0	0.00	0.0	0.00	0.0	0.00
Saint Helena, Ascension and Tristan da Cunha	2	2	2	2	0.0	0.00	0.0	0.00	0.0	0.00
Saint Kitts and Nevis	11	11	11	11	0.0	0.00	0.0	0.00	0.0	0.00
Saint Lucia	21	21	21	21	n.s.	-0.12	n.s.	-0.11	0.0	0.00
Saint Martin (French part)	1	1	1	1	0.0	0.00	0.0	0.00	0.0	0.00
Saint Pierre and Miquelon	2	2	1	1	n.s.	-1.28	n.s.	-1.47	n.s.	-1.64
Saint Vincent and the Grenadines	28	29	29	29	0.1	0.36	0.0	0.00	0.0	0.00
Samoa	176	171	166	162	-0.5	-0.28	-0.5	-0.28	-0.5	-0.29
San Marino	1	1	1	1	0.0	0.00	0.0	0.00	0.0	0.00
Sao Tome and Principe	59	58	58	52	n.s.	-0.04	n.s.	-0.04	-0.6	-1.12
Saudi Arabia	977	977	977	977	0.0	0.00	0.0	0.00	0.0	0.00

(Continued)

TABLE A1. *(Continued)*

Country/territory	Forest area (1 000 ha)				Net annual change					
	1990	2000	2010	2020	1990–2000		2000–2010		2010–2020	
					1 000 ha/yr	%	1 000 ha/yr	%	1 000 ha/yr	%
Senegal	9 303	8 853	8 468	8 068	-45.0	-0.49	-38.5	-0.44	-40.0	-0.48
Serbia	2 313	2 460	2 713	2 723	14.7	0.62	25.3	0.98	1.0	0.04
Seychelles	34	34	34	34	0.0	0.00	0.0	0.00	0.0	0.00
Sierra Leone	3 127	2 929	2 732	2 535	-19.7	-0.65	-19.7	-0.69	-19.7	-0.75
Singapore	15	17	18	16	0.2	1.39	0.1	0.42	-0.2	-1.30
Sint Maarten (Dutch part)	n.s.	n.s.	n.s.	n.s.	0.0	0.00	0.0	0.00	0.0	0.00
Slovakia	1 902	1 901	1 918	1 926	-0.1	-0.01	1.7	0.09	0.8	0.04
Slovenia	1 188	1 233	1 247	1 238	4.5	0.37	1.4	0.11	-0.9	-0.07
Solomon Islands	2 545	2 538	2 530	2 523	-0.7	-0.03	-0.7	-0.03	-0.7	-0.03
Somalia	8 283	7 515	6 748	5 980	-76.8	-0.97	-76.8	-1.07	-76.8	-1.20
South Africa	18 142	17 778	17 414	17 050	-36.4	-0.20	-36.4	-0.21	-36.4	-0.21
South Sudan	7 157	7 157	7 157	7 157	0.0	0.00	0.0	0.00	0.0	0.00
Spain	13 905	17 094	18 545	18 572	318.9	2.09	145.1	0.82	2.7	0.01
Sri Lanka	2 350	2 166	2 104	2 113	-18.4	-0.81	-6.3	-0.29	0.9	0.04
Sudan	23 570	21 826	20 081	18 360	-174.4	-0.77	-174.5	-0.83	-172.2	-0.89
Suriname	15 378	15 341	15 300	15 196	-3.7	-0.02	-4.1	-0.03	-10.4	-0.07
Svalbard and Jan Mayen Islands	0	0	0	0	0.0		0.0		0.0	
Sweden	28 063	28 163	28 073	27 980	10.0	0.04	-9.0	-0.03	-9.3	-0.03
Switzerland	1 154	1 196	1 235	1 269	4.3	0.36	3.9	0.32	3.4	0.28
Syrian Arab Republic	372	432	492	522	6.0	1.51	6.0	1.31	3.0	0.59
Tajikistan	408	410	410	424	0.2	0.05	0.0	0.00	1.4	0.33
Thailand	19 361	18 998	20 073	19 873	-36.3	-0.19	107.5	0.55	-20.0	-0.10
Timor-Leste	963	949	935	921	-1.4	-0.15	-1.4	-0.15	-1.4	-0.15
Togo	1 362	1 268	1 239	1 209	-9.3	-0.71	-3.0	-0.24	-3.0	-0.24
Tokelau	0	0	0	0	0.0		0.0		0.0	
Tonga	9	9	9	9	0.0	0.00	0.0	0.00	0.0	0.00
Trinidad and Tobago	242	237	232	228	-0.5	-0.23	-0.4	-0.18	-0.4	-0.18
Tunisia	644	668	687	703	2.4	0.36	2.0	0.29	1.5	0.22
Turkey	19 783	20 148	21 083	22 220	36.5	0.18	93.5	0.45	113.7	0.53
Turkmenistan	4 127	4 127	4 127	4 127	0.0	0.00	0.0	0.00	0.0	0.00
Turks and Caicos Islands	11	11	11	11	0.0	0.00	0.0	0.00	0.0	0.00
Tuvalu	1	1	1	1	0.0	0.00	0.0	0.00	0.0	0.00
Uganda	3 575	3 163	2 750	2 338	-41.3	-1.22	-41.3	-1.39	-41.3	-1.61
Ukraine	9 274	9 510	9 548	9 690	23.6	0.25	3.8	0.04	14.2	0.15
United Arab Emirates	245	309	317	317	6.4	2.36	0.8	0.25	0.0	0.00
United Kingdom of Great Britain and Northern Ireland	2 778	2 954	3 059	3 190	17.6	0.62	10.5	0.35	13.1	0.42
United Republic of Tanzania	57 390	53 670	49 950	45 745	-372.0	-0.67	-372.0	-0.72	-420.5	-0.88
United States of America	302 450	303 536	308 720	309 795	108.6	0.04	518.4	0.17	107.5	0.03

(Continued)

TABLE A1. *(Continued)*

Country/territory	Forest area (1 000 ha)				Net annual change					
	1990	2000	2010	2020	1990–2000		2000–2010		2010–2020	
					1 000 ha/yr	%	1 000 ha/yr	%	1 000 ha/yr	%
United States Virgin Islands	25	20	18	20	-0.4	-1.80	-0.2	-1.04	0.1	0.78
Uruguay	798	1 369	1 731	2 031	57.1	5.55	36.2	2.38	30.0	1.61
Uzbekistan	2 549	2 961	3 350	3 690	41.2	1.51	38.8	1.24	34.0	0.97
Vanuatu	442	442	442	442	0.0	0.00	0.0	0.00	0.0	0.00
Venezuela (Bolivarian Republic of)	52 026	49 151	47 505	46 231	-287.5	-0.57	-164.6	-0.34	-127.4	-0.27
Viet Nam	9 376	11 784	13 388	14 643	240.8	2.31	160.4	1.28	125.5	0.90
Wallis and Futuna Islands	6	6	6	6	n.s.	0.02	n.s.	0.02	n.s.	0.02
Western Sahara	665	669	665	665	0.4	0.06	-0.4	-0.06	n.s.	n.s.
Yemen	549	549	549	549	0.0	0.00	0.0	0.00	0.0	0.00
Zambia	47 412	47 054	46 696	44 814	-35.8	-0.08	-35.8	-0.08	-188.2	-0.41
Zimbabwe	18 827	18 366	17 905	17 445	-46.1	-0.25	-46.1	-0.25	-46.1	-0.26

Note: The rate of change (%) is calculated as the compound annual change rate.
* A dispute exists between the Government of Argentina and the Government of the United Kingdom of Great Britain and Northern Ireland concerning sovereignty over the Falkland Islands (Malvinas).

TABLE A2. Extent of naturally regenerating forest, 1990–2020

Country/territory	Naturally regenerating forest (1 000 ha)				Net annual change					
	1990	2000	2010	2020	1990–2000		2000–2010		2010–2020	
					1 000 ha/yr	%	1 000 ha/yr	%	1 000 ha/yr	%
Afghanistan	1 208	1 208	1 208	1 208	0.0	0.00	0.0	0.00	0.0	0.00
Albania	–	–	712	–	–	–	–	–	–	–
Algeria	1 334	1 234	1 420	1 439	-10.0	-0.78	18.6	1.41	1.9	0.13
American Samoa	18	18	17	17	n.s.	-0.19	n.s.	-0.17	n.s.	-0.17
Andorra	16	16	16	16	0.0	0.00	0.0	0.00	0.0	0.00
Angola	78 302	76 767	71 284	65 800	-153.5	-0.20	-548.3	-0.74	-548.3	-0.80
Anguilla	–	–	–	–	–	–	–	–	–	–
Antigua and Barbuda	–	–	–	–	–	–	–	–	–	–
Argentina	34 438	32 302	29 027	27 137	-213.6	-0.64	-327.5	-1.06	-189.0	-0.67
Armenia	321	322	310	310	0.1	0.03	-1.2	-0.38	0.0	0.00
Aruba	n.s.	n.s.	n.s.	n.s.	0.0	0.00	0.0	0.00	0.0	0.00
Australia	132 859	130 329	127 378	131 615	-253.0	-0.19	-295.1	-0.23	423.7	0.33
Austria	2 037	2 154	2 184	2 228	11.8	0.56	2.9	0.14	4.4	0.20
Azerbaijan	652	681	743	826	2.9	0.44	6.2	0.88	8.3	1.06
Bahamas	510	510	510	510	0.0	0.00	0.0	0.00	0.0	0.00
Bahrain	0	0	0	0	0.0		0.0		0.0	
Bangladesh	1 845	1 845	1 816	1 725	n.s.	n.s.	-2.9	-0.16	-9.1	-0.51
Barbados	6	6	6	6	0.0	0.00	0.0	0.00	0.0	0.00
Belarus	6 576	6 413	6 484	6 556	-16.3	-0.25	7.0	0.11	7.2	0.11
Belgium	231	259	283	251	2.8	1.15	2.4	0.90	-3.2	-1.20
Belize	1 598	1 457	1 389	1 275	-14.1	-0.92	-6.8	-0.48	-11.4	-0.86
Benin	4 823	4 119	3 615	3 112	-70.4	-1.57	-50.4	-1.30	-50.3	-1.49
Bermuda	–	–	–	–	–	–	–	–	–	–
Bhutan	2 487	2 586	2 686	2 704	9.9	0.39	9.9	0.38	1.9	0.07
Bolivia (Plurinational State of)	57 785	55 066	53 036	50 771	-271.8	-0.48	-203.0	-0.37	-226.5	-0.44
Bonaire, Sint Eustatius and Saba	2	2	2	2	0.0	0.00	0.0	0.00	0.0	0.00
Bosnia and Herzegovina	–	–	–	–	–	–	–	–	–	–
Botswana	18 804	17 621	16 438	15 255	-118.3	-0.65	-118.3	-0.69	-118.3	-0.74
Brazil	585 340	547 436	504 252	485 396	-3 790.4	-0.67	-4 318.4	-0.82	-1 885.6	-0.38
British Virgin Islands										
Brunei Darussalam	412	396	376	375	-1.6	-0.40	-2.0	-0.51	-0.2	-0.04
Bulgaria	2 295	2 442	2 920	3 116	14.7	0.62	47.8	1.80	19.6	0.65
Burkina Faso	7 703	7 148	6 594	6 039	-55.4	-0.74	-55.4	-0.80	-55.5	-0.87

(Continued)

TABLE A2. *(Continued)*

Country/territory	Naturally regenerating forest (1 000 ha)				Net annual change					
	1990	2000	2010	2020	1990–2000		2000–2010		2010–2020	
					1 000 ha/yr	%	1 000 ha/yr	%	1 000 ha/yr	%
Burundi	115	81	81	167	-3.4	-3.46	0.0	0.00	8.6	7.49
Cabo Verde	14	14	14	14	0.0	0.00	0.0	0.00	0.0	0.00
Cambodia	10 938	10 681	10 435	7 464	-25.6	-0.24	-24.6	-0.23	-297.0	-3.29
Cameroon	22 482	21 576	20 859	20 279	-90.6	-0.41	-71.7	-0.34	-58.0	-0.28
Canada	343 655	338 416	333 306	328 765	-523.9	-0.15	-510.9	-0.15	-454.2	-0.14
Cayman Islands	13	13	13	13	n.s.	-0.15	n.s.	-0.16	0.0	0.00
Central African Republic	23 201	22 901	22 601	22 301	-30.0	-0.13	-30.0	-0.13	-30.0	-0.13
Chad	6 719	6 339	5 513	4 293	-38.0	-0.58	-82.6	-1.39	-122.0	-2.47
Chile	13 600	13 539	13 895	15 026	-6.1	-0.04	35.6	0.26	113.1	0.79
China	112 989	122 170	127 286	135 282	918.2	0.78	511.6	0.41	799.6	0.61
Colombia	64 861	62 570	60 426	58 715	-229.1	-0.36	-214.3	-0.35	-171.2	-0.29
Comoros	43	39	36	33	-0.3	-0.80	-0.3	-0.87	-0.3	-0.95
Congo	22 256	22 136	22 016	21 887	-12.0	-0.05	-12.0	-0.05	-12.9	-0.06
Cook Islands	14	14	14	14	0.0	0.00	0.0	0.00	0.0	0.00
Costa Rica	2 881	2 811	2 804	2 948	-7.0	-0.25	-0.6	-0.02	14.4	0.50
Côte d'Ivoire	7 844	5 081	3 951	2 823	-276.4	-4.25	-112.9	-2.48	-112.9	-3.31
Croatia	1 758	1 803	1 845	1 871	4.6	0.26	4.2	0.23	2.5	0.14
Cuba	1 711	2 093	2 436	2 709	38.2	2.04	34.3	1.53	27.3	1.07
Curaçao	n.s.	n.s.	n.s.	n.s.	0.0	0.00	0.0	0.00	0.0	0.00
Cyprus	137	144	142	140	0.7	0.52	-0.2	-0.13	-0.2	-0.17
Czechia	31	47	88	138	1.6	4.28	4.0	6.39	5.0	4.61
Democratic People's Republic of Korea	5 782	5 399	5 222	5 043	-38.3	-0.68	-17.8	-0.33	-17.9	-0.35
Democratic Republic of the Congo	150 574	143 842	137 111	126 098	-673.1	-0.46	-673.1	-0.48	-1 101.4	-0.83
Denmark	–	–	140	216	–	–	–	–	7.7	4.49
Djibouti	6	6	6	6	0.0	0.00	0.0	0.00	0.0	0.00
Dominica	50	47	47	47	-0.2	-0.50	0.0	0.00	0.0	0.00
Dominican Republic	1 574	1 929	1 963	1 954	35.6	2.06	3.3	0.17	-0.9	-0.04
Ecuador	14 588	13 660	12 943	12 387	-92.7	-0.65	-71.7	-0.54	-55.7	-0.44
Egypt	0	0	0	0	0.0		0.0		0.0	
El Salvador	709	661	614	566	-4.8	-0.69	-4.8	-0.74	-4.8	-0.80
Equatorial Guinea	2 699	2 491	2 407	2 323	-20.9	-0.80	-8.4	-0.34	-8.4	-0.35
Eritrea	1 140	1 097	1 058	1 012	-4.3	-0.38	-3.9	-0.36	-4.6	-0.45
Estonia	2 011	2 041	2 129	2 223	3.0	0.15	8.9	0.43	9.3	0.43
Eswatini	297	330	363	396	3.3	1.05	3.3	0.95	3.3	0.87
Ethiopia	18 919	18 189	17 058	15 865	-73.0	-0.39	-113.1	-0.64	-119.3	-0.72
Falkland Islands (Malvinas)*	0	0	0	0	0.0		0.0		0.0	
Faroe Islands	0	0	0	0	0.0		0.0		0.0	
Fiji	855	881	907	933	2.6	0.30	2.6	0.29	2.6	0.28

(Continued)

TABLE A2. *(Continued)*

Country/territory	Naturally regenerating forest (1 000 ha)				Net annual change					
	1990	2000	2010	2020	1990–2000		2000–2010		2010–2020	
					1 000 ha/yr	%	1 000 ha/yr	%	1 000 ha/yr	%
Finland	17 485	17 301	15 334	15 041	-18.4	-0.11	-196.7	-1.20	-29.3	-0.19
France	12 908	13 702	14 346	14 819	79.4	0.60	64.4	0.46	47.3	0.32
French Guiana	8 124	8 079	8 036	8 002	-4.6	-0.06	-4.3	-0.05	-3.4	-0.04
French Polynesia	140	140	140	140	0.0	0.00	0.0	0.00	0.0	0.00
Gabon	23 731	23 670	23 619	23 501	-6.1	-0.03	-5.1	-0.02	-11.9	-0.05
Gambia	413	356	298	241	-5.7	-1.48	-5.7	-1.74	-5.7	-2.11
Georgia	2 698	2 701	2 750	2 750	0.2	0.01	5.0	0.18	n.s.	n.s.
Germany	5 650	5 677	5 705	5 710	2.7	0.05	2.8	0.05	0.5	0.01
Ghana	9 874	8 799	7 723	7 689	-107.6	-1.15	-107.6	-1.30	-3.4	-0.04
Gibraltar	0	0	0	0	0.0		0.0		0.0	
Greece	3 181	3 472	3 763	3 763	29.1	0.88	29.1	0.81	n.s.	n.s.
Greenland	0	0	0	0	0.0		0.0		0.0	
Grenada	17	17	17	17	0.0	0.00	0.0	0.00	0.0	0.00
Guadeloupe	73	72	71	71	-0.1	-0.12	-0.1	-0.10	n.s.	0.05
Guam	24	24	24	28	0.0	0.00	0.0	0.00	0.4	1.55
Guatemala	4 757	4 172	3 611	3 376	-58.5	-1.30	-56.1	-1.43	-23.5	-0.67
Guernsey	n.s.	n.s.	n.s.	n.s.	0.0	0.00	n.s.	3.87	0.0	0.00
Guinea	7 236	6 884	6 517	6 132	-35.2	-0.50	-36.7	-0.55	-38.5	-0.61
Guinea-Bissau	2 233	2 149	2 064	1 979	-8.4	-0.38	-8.5	-0.40	-8.5	-0.42
Guyana	18 602	18 564	18 520	18 415	-3.8	-0.02	-4.4	-0.02	-10.4	-0.06
Haiti	371	361	350	315	-1.0	-0.28	-1.0	-0.29	-3.5	-1.05
Holy See	0	0	0	0	0.0		0.0		0.0	
Honduras	6 988	6 779	6 575	6 359	-20.9	-0.30	-20.3	-0.30	-21.6	-0.33
Hungary	–	–	1 253	1 264	–	–	–	–	1.2	0.09
Iceland	11	11	11	12	n.s.	0.40	n.s.	0.39	n.s.	0.36
India	58 223	58 223	56 717	58 891	0.0	0.00	-150.6	-0.26	217.4	0.38
Indonesia	118 400	97 432	95 473	87 608	-2 096.8	-1.93	-195.9	-0.20	-786.5	-0.86
Iran (Islamic Republic of)	8 560	8 810	9 751	9 751	25.0	0.29	94.1	1.02	0.0	0.00
Iraq	743	754	758	735	1.1	0.15	0.4	0.05	-2.3	-0.30
Ireland	81	81	81	108	n.s.	0.02	-0.1	-0.08	2.7	2.92
Isle of Man	–	–	–	–	–	–	–	–	–	–
Israel	66	65	66	55	-0.1	-0.15	0.1	0.15	-1.1	-1.81
Italy	7 061	7 774	8 394	8 921	71.3	0.97	62.0	0.77	52.7	0.61
Jamaica	512	513	550	589	n.s.	0.01	3.7	0.71	3.8	0.68
Japan	14 663	14 545	14 674	14 751	-11.8	-0.08	12.9	0.09	7.7	0.05
Jersey	–	–	–	–	–	–	–	–	–	–
Jordan	51	51	51	51	0.0	0.00	0.0	0.00	0.0	0.00
Kazakhstan	2 645	2 628	2 638	3 034	-1.7	-0.06	1.0	0.04	39.6	1.41
Kenya	3 706	3 808	3 464	3 458	10.3	0.27	-34.5	-0.94	-0.5	-0.02
Kiribati	–	–	–	–	–	–	–	–	–	–

(Continued)

TABLE A2. *(Continued)*

Country/territory	Naturally regenerating forest (1 000 ha)				Net annual change					
	1990	2000	2010	2020	1990–2000		2000–2010		2010–2020	
					1 000 ha/yr	%	1 000 ha/yr	%	1 000 ha/yr	%
Kuwait	0	0	0	0	0.0		0.0		0.0	
Kyrgyzstan	977	1 016	1 045	1 086	3.8	0.38	2.9	0.29	4.1	0.39
Lao People's Democratic Republic	16 237	15 845	15 345	14 824	-39.2	-0.24	-50.0	-0.32	-52.1	-0.34
Latvia	2 859	2 919	2 964	2 945	6.0	0.21	4.6	0.16	-1.9	-0.06
Lebanon	139	138	137	143	-0.1	-0.07	-0.1	-0.04	0.6	0.42
Lesotho	26	26	26	26	0.0	0.00	0.0	0.00	0.0	0.00
Liberia	8 524	8 213	7 902	7 590	-31.1	-0.37	-31.1	-0.39	-31.1	-0.40
Libya	0	0	0	0	0.0		0.0		0.0	
Liechtenstein	6	6	6	6	n.s.	-0.32	0.0	0.00	0.0	0.00
Lithuania	1 534	1 554	1 634	1 590	2.0	0.13	8.0	0.51	-4.4	-0.27
Luxembourg	58	59	59	59	0.1	0.17	0.0	0.00	0.0	0.00
Madagascar	13 462	12 759	12 147	12 118	-70.4	-0.54	-61.2	-0.49	-2.9	-0.02
Malawi	3 363	2 964	2 565	2 166	-39.9	-1.25	-39.9	-1.43	-39.9	-1.68
Malaysia	18 684	18 064	17 639	17 417	-62.0	-0.34	-42.5	-0.24	-22.2	-0.13
Maldives	1	1	1	1	0.0	0.00	0.0	0.00	0.0	0.00
Mali	13 291	13 241	12 766	12 728	-5.0	-0.04	-47.5	-0.36	-3.8	-0.03
Malta	n.s.	n.s.	n.s.	n.s.	0.0	0.00	0.0	0.00	n.s.	1.84
Marshall Islands	6	6	6	6	0.0	0.00	0.0	0.00	0.0	0.00
Martinique	45	46	48	50	0.1	0.16	0.1	0.31	0.2	0.41
Mauritania	466	400	335	269	-6.6	-1.51	-6.6	-1.77	-6.6	-2.15
Mauritius	24	24	20	20	0.0	0.00	-0.4	-1.58	n.s.	n.s.
Mayotte	20	16	14	13	-0.4	-2.43	-0.2	-1.07	-0.1	-0.41
Mexico	70 552	68 342	66 877	65 592	-221.1	-0.32	-146.5	-0.22	-128.5	-0.19
Micronesia (Federated States of)	43	47	50	50	0.3	0.74	0.3	0.68	n.s.	0.06
Monaco	0	0	0	0	0.0		0.0		0.0	
Mongolia	14 348	14 255	14 174	14 165	-9.3	-0.06	-8.1	-0.06	-0.9	-0.01
Montenegro	618	618	819	819	0.0	0.00	20.1	2.86	0.0	0.00
Montserrat	4	3	3	3	-0.1	-3.31	0.0	0.00	0.0	0.00
Morocco	5 167	5 162	5 151	5 108	-0.5	-0.01	-1.1	-0.02	-4.4	-0.09
Mozambique	43 340	41 150	38 918	36 669	-219.0	-0.52	-223.3	-0.56	-224.8	-0.59
Myanmar	39 187	34 837	31 135	28 118	-435.0	-1.17	-370.2	-1.12	-301.7	-1.01
Namibia	8 769	8 059	7 349	6 639	-71.0	-0.84	-71.0	-0.92	-71.0	-1.01
Nauru	0	0	0	0	0.0		0.0		0.0	
Nepal	5 584	5 643	5 741	5 741	5.9	0.11	9.8	0.17	n.s.	n.s.
Netherlands	50	46	41	38	-0.4	-0.83	-0.5	-1.16	-0.3	-0.75
New Caledonia	822	828	829	828	0.6	0.07	0.1	0.01	-0.2	-0.02
New Zealand	7 841	7 825	7 824	7 808	-1.6	-0.02	-0.2	n.s.	-1.6	-0.02
Nicaragua	6 399	5 397	4 172	3 341	-100.2	-1.69	-122.5	-2.54	-83.1	-2.20

(Continued)

TABLE A2. *(Continued)*

Country/territory	Naturally regenerating forest (1 000 ha)				Net annual change					
	1990	2000	2010	2020	1990–2000		2000–2010		2010–2020	
					1 000 ha/yr	%	1 000 ha/yr	%	1 000 ha/yr	%
Niger	1 897	1 255	1 106	957	-64.2	-4.05	-14.9	-1.26	-14.9	-1.43
Nigeria	26 260	24 644	23 027	21 411	-161.6	-0.63	-161.7	-0.68	-161.7	-0.73
Niue	19	19	19	19	n.s.	-0.05	n.s.	-0.03	n.s.	0.05
Norfolk Island	n.s.	n.s.	n.s.	n.s.	0.0	0.00	0.0	0.00	0.0	0.00
North Macedonia	–	–	–	–	–	–	–	–	–	–
Northern Mariana Islands	34	32	30	24	-0.2	-0.50	-0.2	-0.53	-0.6	-2.16
Norway	–	–	11 987	12 072	–	–	–	–	8.5	0.07
Oman	2	2	2	2	0.0	0.00	0.0	0.00	0.0	0.00
Pakistan	4 733	4 257	3 840	3 472	-47.6	-1.05	-41.8	-1.03	-36.8	-1.00
Palau	–	–	–	–	–	–	–	–	–	–
Palestine	–	–	–	–	–	–	–	–	–	–
Panama	4 596	4 409	4 272	4 148	-18.7	-0.41	-13.7	-0.32	-12.4	-0.29
Papua New Guinea	36 339	36 217	36 118	35 796	-12.2	-0.03	-9.9	-0.03	-32.2	-0.09
Paraguay	25 536	22 961	19 519	15 947	-257.4	-1.06	-344.2	-1.61	-357.3	-2.00
Peru	76 186	74 583	73 080	71 242	-160.3	-0.21	-150.3	-0.20	-183.8	-0.25
Philippines	7 488	6 989	6 489	6 808	-50.0	-0.69	-50.0	-0.74	31.9	0.48
Pitcairn Islands	–	–	–	–	–	–	–	–	–	–
Poland	–	–	–	–	–	–	–	–	–	–
Portugal	1 326	1 013	1 030	1 056	-31.3	-2.66	1.7	0.17	2.6	0.25
Puerto Rico	320	429	491	496	10.9	2.97	6.2	1.36	0.5	0.10
Qatar	0	0	0	0	0.0		0.0		0.0	
Republic of Korea	4 642	4 404	4 152	4 024	-23.8	-0.53	-25.2	-0.59	-12.8	-0.31
Republic of Moldova	179	189	163	168	1.0	0.57	-2.7	-1.52	0.5	0.32
Réunion	77	80	83	88	0.3	0.38	0.3	0.37	0.4	0.52
Romania	5 843	5 838	5 975	6 034	-0.5	-0.01	13.7	0.23	5.9	0.10
Russian Federation	796 299	793 908	795 523	796 432	-239.1	-0.03	161.5	0.02	90.9	0.01
Rwanda	204	161	126	126	-4.3	-2.34	-3.5	-2.42	0.0	0.00
Saint Barthélemy	n.s.	n.s.	n.s.	n.s.	0.0	0.00	0.0	0.00	0.0	0.00
Saint Helena, Ascension and Tristan da Cunha	2	2	2	2	0.0	0.00	0.0	0.00	0.0	0.00
Saint Kitts and Nevis	–	–	–	–	–	–	–	–	–	–
Saint Lucia	19	18	17	17	-0.1	-0.33	-0.1	-0.34	0.0	0.00
Saint Martin (French part)	1	1	1	1	0.0	0.00	0.0	0.00	0.0	0.00
Saint Pierre and Miquelon	2	2	1	1	n.s.	-1.28	n.s.	-1.47	n.s.	-1.64
Saint Vincent and the Grenadines	28	29	28	28	0.1	0.39	n.s.	-0.08	n.s.	-0.04
Samoa	171	166	161	157	-0.5	-0.28	-0.5	-0.29	-0.5	-0.30
San Marino	1	1	1	1	0.0	0.00	0.0	0.00	0.0	0.00
Sao Tome and Principe	59	58	58	52	n.s.	-0.04	n.s.	-0.04	-0.6	-1.12
Saudi Arabia	977	977	977	977	0.0	0.00	0.0	0.00	0.0	0.00

(Continued)

TABLE A2. *(Continued)*

Country/territory	Naturally regenerating forest (1 000 ha)				Net annual change					
	1990	2000	2010	2020	1990–2000		2000–2010		2010–2020	
					1 000 ha/yr	%	1 000 ha/yr	%	1 000 ha/yr	%
Senegal	9 271	8 821	8 436	8 036	-45.0	-0.50	-38.5	-0.45	-40.0	-0.48
Serbia	2 274	2 421	2 533	2 607	14.7	0.63	11.2	0.45	7.4	0.29
Seychelles	29	29	29	29	0.0	0.00	0.0	0.00	0.0	0.00
Sierra Leone	3 120	2 922	2 718	2 514	-19.8	-0.65	-20.4	-0.72	-20.4	-0.78
Singapore	15	17	18	16	0.2	1.39	0.1	0.42	-0.2	-1.30
Sint Maarten (Dutch part)	n.s.	n.s.	n.s.	n.s.	0.0	0.00	0.0	0.00	0.0	0.00
Slovakia	1 164	1 146	1 177	1 177	-1.7	-0.15	3.0	0.26	0.1	0.01
Slovenia	1 154	1 185	1 180	1 192	3.1	0.27	-0.5	-0.04	1.2	0.10
Solomon Islands	2 503	2 505	2 504	2 499	0.2	0.01	-0.1	-0.01	-0.5	-0.02
Somalia	8 280	7 512	6 745	5 977	-76.8	-0.97	-76.8	-1.07	-76.8	-1.20
South Africa	14 998	14 634	14 270	13 906	-36.4	-0.25	-36.4	-0.25	-36.4	-0.26
South Sudan	6 969	6 969	6 969	6 969	0.0	0.00	0.0	0.00	0.0	0.00
Spain	11 959	14 703	15 949	15 982	274.3	2.09	124.6	0.82	3.3	0.02
Sri Lanka	2 094	1 933	1 898	1 863	-16.1	-0.80	-3.5	-0.18	-3.5	-0.18
Sudan	23 450	21 701	19 954	18 230	-174.9	-0.77	-174.7	-0.84	-172.5	-0.90
Suriname	15 365	15 327	15 286	15 182	-3.8	-0.02	-4.1	-0.03	-10.4	-0.07
Svalbard and Jan Mayen Islands	0	0	0	0	0.0		0.0		0.0	
Sweden	19 974	17 845	15 592	14 068	-212.9	-1.12	-225.3	-1.34	-152.4	-1.02
Switzerland	971	1 024	1 074	1 120	5.3	0.54	5.0	0.48	4.6	0.42
Syrian Arab Republic	223	259	296	311	3.6	1.51	3.6	1.32	1.5	0.50
Tajikistan	295	297	297	307	0.1	0.05	0.0	0.00	1.0	0.32
Thailand	17 641	17 011	16 831	16 336	-63.0	-0.36	-18.0	-0.11	-49.5	-0.30
Timor-Leste	963	949	935	921	-1.4	-0.15	-1.4	-0.15	-1.4	-0.15
Togo	1 341	1 234	1 192	1 149	-10.7	-0.82	-4.3	-0.35	-4.3	-0.37
Tokelau	0	0	0	0	0.0		0.0		0.0	
Tonga	8	8	8	8	0.0	0.00	0.0	0.00	0.0	0.00
Trinidad and Tobago	159	156	151	147	-0.3	-0.17	-0.5	-0.33	-0.3	-0.23
Tunisia	491	491	490	488	n.s.	-0.01	-0.1	-0.02	-0.1	-0.03
Turkey	19 238	19 593	20 461	21 503	35.5	0.18	86.8	0.43	104.2	0.50
Turkmenistan	4 127	4 127	4 127	4 127	0.0	0.00	0.0	0.00	0.0	0.00
Turks and Caicos Islands	11	11	11	11	0.0	0.00	0.0	0.00	0.0	0.00
Tuvalu	1	1	1	1	0.0	0.00	0.0	0.00	0.0	0.00
Uganda	3 406	2 895	2 384	1 873	-51.1	-1.61	-51.1	-1.92	-51.1	-2.38
Ukraine	4 707	4 815	4 731	4 842	10.8	0.23	-8.4	-0.18	11.1	0.23
United Arab Emirates	–	–	–	–	–	–	–	–	–	–
United Kingdom of Great Britain and Northern Ireland	344	344	344	344	0.0	0.00	0.0	0.00	0.0	0.00
United Republic of Tanzania	56 837	53 117	49 397	45 192	-372.0	-0.67	-372.0	-0.72	-420.5	-0.89
United States of America	284 512	280 976	283 156	282 274	-353.6	-0.12	218.0	0.08	-88.2	-0.03

(Continued)

TABLE A2. *(Continued)*

Country/territory	Naturally regenerating forest (1 000 ha)				Net annual change					
	1990	2000	2010	2020	1990–2000		2000–2010		2010–2020	
					1 000 ha/yr	%	1 000 ha/yr	%	1 000 ha/yr	%
United States Virgin Islands	25	20	18	20	-0.4	-1.80	-0.2	-1.04	0.1	0.78
Uruguay	597	740	752	849	14.3	2.17	1.2	0.16	9.7	1.22
Uzbekistan	1 356	1 416	1 497	1 423	6.0	0.43	8.1	0.56	-7.4	-0.51
Vanuatu	–	–	–	–	–	–	–	–	–	–
Venezuela (Bolivarian Republic of)	51 600	48 411	46 516	44 873	-318.9	-0.64	-189.6	-0.40	-164.3	-0.36
Viet Nam	8 631	9 865	10 305	10 294	123.4	1.34	44.0	0.44	-1.1	-0.01
Wallis and Futuna Islands	6	5	5	5	n.s.	-0.31	n.s.	-0.32	n.s.	-0.17
Western Sahara	665	669	665	665	0.4	0.06	-0.4	-0.06	n.s.	n.s.
Yemen	549	549	549	549	0.0	0.00	0.0	0.00	0.0	0.00
Zambia	47 355	46 999	46 642	44 762	-35.6	-0.08	-35.7	-0.08	-188.0	-0.41
Zimbabwe	18 673	18 246	17 797	17 337	-42.7	-0.23	-44.9	-0.25	-46.1	-0.26

Note: The rate of change (%) is calculated as the compound annual change rate.
* A dispute exists between the Government of Argentina and the Government of the United Kingdom of Great Britain and Northern Ireland concerning sovereignty over the Falkland Islands (Malvinas).

TABLE A3. Extent of planted forest, 1990–2020

Country/territory	Planted forest (1 000 ha)				Net annual change					
	1990	2000	2010	2020	1990–2000		2000–2010		2010–2020	
					1 000 ha/yr	%	1 000 ha/yr	%	1 000 ha/yr	%
Afghanistan	0	0	0	0	0.00		0.00		0.00	
Albania	–	–	70	–	–	–	–	–	–	–
Algeria	333	345	498	510	1.20	0.35	15.30	3.74	1.20	0.24
American Samoa	0	0	0	0	0.00		0.00		0.00	
Andorra	0	0	0	0	0.00		0.00		0.00	
Angola	961	942	874	807	-1.88	-0.20	-6.73	-0.74	-6.73	-0.80
Anguilla	–	–	–	–	–	–	–	–	–	–
Antigua and Barbuda	–	–	–	–	–	–	–	–	–	–
Argentina	766	1 076	1 187	1 436	31.00	3.46	11.10	0.99	24.90	1.92
Armenia	14	11	21	18	-0.31	-2.52	0.99	6.81	-0.21	-1.07
Aruba	0	0	0	0	0.00		0.00		0.00	
Australia	1 023	1 485	2 168	2 390	46.18	3.80	68.32	3.86	22.24	0.98
Austria	1 739	1 684	1 679	1 672	-5.57	-0.32	-0.44	-0.03	-0.78	-0.05
Azerbaijan	293	306	289	306	1.32	0.44	-1.69	-0.57	1.65	0.56
Bahamas	0	0	0	0	0.00		0.00		0.00	
Bahrain	n.s.	n.s.	1	1	0.02	5.34	0.02	3.46	0.02	3.02
Bangladesh	75	75	72	158	0.00	0.00	-0.32	-0.44	8.61	8.19
Barbados	0	0	0	0	0.00		0.00		0.00	
Belarus	1 204	1 861	2 146	2 212	65.70	4.45	28.57	1.44	6.57	0.30
Belgium	446	408	406	438	-3.84	-0.90	-0.15	-0.04	3.18	0.76
Belize	2	2	2	2	0.01	0.52	0.01	0.50	0.01	0.47
Benin	13	16	20	23	0.30	2.10	0.40	2.26	0.30	1.41
Bermuda										
Bhutan	19	20	20	21	0.02	0.11	0.02	0.11	0.11	0.53
Bolivia (Plurinational State of)	20	35	50	63	1.51	5.77	1.51	3.64	1.25	2.25
Bonaire, Sint Eustatius and Saba	0	0	0	0	0.00		0.00		0.00	
Bosnia and Herzegovina	–	–	–	–	–	–	–	–	–	–
Botswana	0	0	0	0	0.00		0.00		0.00	
Brazil	3 558	3 652	7 328	11 224	9.41	0.26	367.61	7.21	389.53	4.35
British Virgin Islands	–	–	–	–	–	–	–	–	–	–
Brunei Darussalam	1	1	4	5	0.06	6.93	0.24	10.97	0.16	3.55
Bulgaria	1 032	933	817	777	-9.90	-1.00	-11.60	-1.32	-4.00	-0.50
Burkina Faso	14	68	123	177	5.43	17.17	5.44	6.03	5.44	3.74

(Continued)

TABLE A3. *(Continued)*

Country/territory	Planted forest (1 000 ha)				Net annual change					
	1990	2000	2010	2020	1990–2000		2000–2010		2010–2020	
					1 000 ha/yr	%	1 000 ha/yr	%	1 000 ha/yr	%
Burundi	161	113	113	113	-4.84	-3.50	0.00	0.00	0.00	0.00
Cabo Verde	2	26	29	32	2.43	31.38	0.30	1.10	0.30	0.99
Cambodia	67	100	155	604	3.26	4.03	5.46	4.46	44.94	14.60
Cameroon	18	21	41	61	0.30	1.55	2.00	6.89	2.00	4.04
Canada	4 618	9 386	14 016	18 163	476.79	7.35	462.96	4.09	414.76	2.63
Cayman Islands	0	0	0	0	0.00		0.00		0.00	
Central African Republic	2	2	2	2	0.00	0.00	0.00	0.00	0.00	0.00
Chad	11	14	18	20	0.30	2.48	0.39	2.52	0.21	1.13
Chile	1 646	2 278	2 830	3 185	63.19	3.30	55.23	2.19	35.43	1.19
China	44 152	54 830	73 324	84 696	1067.83	2.19	1849.39	2.95	1137.22	1.45
Colombia	97	166	381	427	6.87	5.50	21.56	8.69	4.61	1.15
Comoros	4	2	1	n.s.	-0.11	-3.69	-0.11	-5.91	-0.11	-16.73
Congo	60	60	60	60	0.00	0.00	0.00	0.00	0.00	0.00
Cook Islands	1	1	1	1	0.06	7.99	0.00	0.00	0.00	0.00
Costa Rica	27	47	67	87	2.00	5.77	2.00	3.64	2.00	2.66
Côte d'Ivoire	7	14	14	14	0.73	7.61	0.00	0.00	0.00	0.00
Croatia	92	82	75	69	-1.07	-1.23	-0.68	-0.86	-0.63	-0.87
Cuba	347	342	496	533	-0.50	-0.15	15.40	3.79	3.67	0.72
Curaçao	0	0	0	0	0.00		0.00		0.00	
Cyprus	24	28	31	33	0.32	1.25	0.31	1.08	0.21	0.65
Czechia	2 598	2 590	2 570	2 539	-0.83	-0.03	-2.04	-0.08	-3.02	-0.12
Democratic People's Republic of Korea	1 130	1 055	1 021	987	-7.48	-0.68	-3.47	-0.33	-3.32	-0.33
Democratic Republic of the Congo	56	57	58	58	0.12	0.21	0.10	0.17	0.00	0.00
Denmark	–	–	447	412	–	–	–	–	-3.49	-0.81
Djibouti	0	0	0	n.s.	0.00		0.00		0.02	
Dominica	1	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
Dominican Republic	21	43	110	190	2.20	7.44	6.73	9.87	7.97	5.59
Ecuador	44	70	85	111	2.57	4.67	1.47	1.92	2.62	2.73
Egypt	44	59	66	45	1.54	3.06	0.64	1.04	-2.07	-3.71
El Salvador	10	12	15	18	0.26	2.32	0.26	1.89	0.26	1.58
Equatorial Guinea	0	125	125	125	12.50		0.00	0.00	0.00	0.00
Eritrea	10	21	29	43	1.10	7.70	0.75	3.10	1.49	4.30
Estonia	195	198	207	216	0.29	0.15	0.86	0.43	0.91	0.43
Eswatini	164	143	123	102	-2.06	-1.34	-2.06	-1.54	-2.06	-1.82
Ethiopia	340	340	741	1 203	0.00	0.00	40.11	8.11	46.26	4.97
Falkland Islands (Malvinas)*	0	0	0	0	0.00		0.00		0.00	
Faroe Islands	n.s.	n.s.	n.s.	n.s.	0.00	0.00	0.00	0.00	0.00	0.00
Fiji	85	125	166	207	4.07	4.00	4.07	2.85	4.07	2.21

(Continued)

TABLE A3. *(Continued)*

Country/territory	Planted forest (1 000 ha)				Net annual change					
	1990	2000	2010	2020	1990–2000		2000–2010		2010–2020	
					1 000 ha/yr	%	1 000 ha/yr	%	1 000 ha/yr	%
Finland	4 390	5 145	6 908	7 368	75.42	1.60	176.38	2.99	45.97	0.65
France	1 528	1 586	2 073	2 434	5.80	0.37	48.70	2.71	36.10	1.62
French Guiana	1	1	1	1	0.00	0.00	0.00	0.00	0.01	1.34
French Polynesia	4	9	9	9	0.41	6.80	0.09	1.02	0.00	0.00
Gabon	30	30	30	30	0.00	0.00	0.00	0.00	0.00	0.00
Gambia	2	2	2	2	0.00	0.00	0.00	0.00	0.00	0.00
Georgia	54	60	72	72	0.60	1.05	1.21	1.85	0.00	0.00
Germany	5 650	5 677	5 705	5 710	2.70	0.05	2.75	0.05	0.50	0.01
Ghana	50	50	220	297	0.00	0.00	17.00	15.97	7.71	3.05
Gibraltar	0	0	0	0	0.00		0.00		0.00	
Greece	118	129	139	139	1.08	0.88	1.04	0.78	0.00	0.00
Greenland	n.s.	n.s.	n.s.	n.s.	0.00	0.00	0.00	0.00	0.00	0.00
Grenada	n.s.	n.s.	n.s.	n.s.	0.00	0.00	0.00	0.00	0.00	0.00
Guadeloupe	1	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
Guam	0	0	0	0	0.00		0.00		0.00	
Guatemala	24	37	112	152	1.30	4.42	7.47	11.68	4.02	3.12
Guernsey	n.s.	n.s.	n.s.	n.s.	0.00	0.00	0.01	8.20	0.00	0.00
Guinea	40	45	52	57	0.50	1.18	0.70	1.46	0.50	0.92
Guinea-Bissau	n.s.	n.s.	1	1	0.02	5.83	0.03	6.73	0.03	3.99
Guyana	0	0	0	0	0.00		0.00		0.00	
Haiti	12	20	28	32	0.80	5.24	0.80	3.42	0.40	1.34
Holy See	0	0	0	0	0.00		0.00		0.00	
Honduras	0	0	0	0	0.00		0.00		0.00	
Hungary	–	–	794	789	–	–	–	–	-0.50	-0.06
Iceland	7	19	33	40	1.23	11.16	1.44	5.83	0.63	1.74
India	5 715	9 368	12 779	13 269	365.30	5.07	341.07	3.15	49.03	0.38
Indonesia	145	3 848	4 187	4 526	370.25	38.75	33.85	0.85	33.92	0.78
Iran (Islamic Republic of)	516	516	941	1 001	0.00	0.00	42.53	6.20	5.99	0.62
Iraq	61	64	67	90	0.30	0.49	0.32	0.49	2.28	2.97
Ireland	380	549	640	674	16.85	3.74	9.07	1.54	3.46	0.53
Isle of Man	–	–	–	–	–	–	–	–	–	–
Israel	66	88	88	85	2.20	2.92	0.00	0.00	-0.30	-0.35
Italy	529	596	634	645	6.68	1.20	3.88	0.63	1.07	0.17
Jamaica	9	8	8	8	-0.06	-0.68	0.01	0.10	0.01	0.11
Japan	10 287	10 331	10 292	10 184	4.40	0.04	-3.90	-0.04	-10.80	-0.11
Jersey	–	–	–	–	–	–	–	–	–	–
Jordan	47	47	47	47	0.00	0.00	0.00	0.00	0.00	0.00
Kazakhstan	517	529	444	421	1.18	0.23	-8.43	-1.72	-2.37	-0.55
Kenya	153	153	153	153	0.00	0.00	0.00	0.00	0.00	0.00
Kiribati	–	–	–	–	–	–	–	–	–	–

(Continued)

TABLE A3. *(Continued)*

Country/territory	Planted forest (1 000 ha)				Net annual change					
	1990	2000	2010	2020	1990–2000		2000–2010		2010–2020	
					1 000 ha/yr	%	1 000 ha/yr	%	1 000 ha/yr	%
Kuwait	3	5	6	6	0.14	3.46	0.14	2.57	0.00	0.00
Kyrgyzstan	159	165	185	229	0.62	0.38	1.94	1.12	4.40	2.16
Lao People's Democratic Republic	1 606	1 580	1 596	1 771	-2.60	-0.16	1.58	0.10	17.55	1.05
Latvia	314	322	408	465	0.77	0.24	8.56	2.38	5.78	1.33
Lebanon	1	1	n.s.	n.s.	-0.05	-6.12	-0.03	-5.36	0.00	0.29
Lesotho	9	9	9	9	0.00	0.00	0.00	0.00	0.00	0.00
Liberia	1	10	18	27	0.86	23.38	0.86	6.50	0.86	3.91
Libya	217	217	217	217	0.00	0.00	0.00	0.00	0.00	0.00
Liechtenstein	n.s.	1	1	1	0.04	11.61	0.00	0.00	0.00	0.00
Lithuania	411	466	536	611	5.52	1.27	6.96	1.40	7.52	1.32
Luxembourg	28	28	30	30	-0.01	-0.04	0.20	0.69	0.00	0.00
Madagascar	231	272	415	312	4.10	1.65	14.30	4.32	-10.30	-2.81
Malawi	139	118	97	76	-2.11	-1.63	-2.12	-1.96	-2.11	-2.43
Malaysia	1 935	1 628	1 309	1 697	-30.72	-1.71	-31.86	-2.16	38.82	2.63
Maldives	0	0	0	0	0.00		0.00		0.00	
Mali	5	55	530	568	5.00	27.10	47.50	25.43	3.80	0.69
Malta	0	0	0	n.s.	0.00		0.00		0.00	
Marshall Islands	3	3	3	3	0.00	0.00	0.00	0.00	0.00	0.00
Martinique	2	3	3	3	0.02	0.60	0.01	0.34	0.00	0.07
Mauritania	10	21	32	44	1.12	7.75	1.12	4.32	1.11	3.00
Mauritius	17	18	18	18	0.09	0.49	-0.01	-0.03	-0.01	-0.06
Mayotte	n.s.	n.s.	n.s.	1	0.01	5.84	0.02	4.37	0.01	1.80
Mexico	39	40	67	100	0.03	0.08	2.68	5.28	3.39	4.20
Micronesia (Federated States of)	20	17	14	14	-0.30	-1.60	-0.30	-1.91	0.00	0.00
Monaco	0	0	0	0	0.00		0.00		0.00	
Mongolia	4	9	10	8	0.46	7.45	0.11	1.15	-0.24	-2.72
Montenegro	8	8	8	8	0.00	0.00	0.00	0.00	0.00	0.00
Montserrat	0	0	0	0	0.00		0.00		0.00	
Morocco	318	344	523	635	2.59	0.79	17.88	4.27	11.15	1.95
Mozambique	38	38	55	74	0.00	0.00	1.66	3.70	1.96	3.12
Myanmar	31	31	305	427	0.00	0.01	27.45	25.81	12.19	3.42
Namibia	0	0	0	0	0.00		0.00		0.00	
Nauru	0	0	0	0	0.00		0.00		0.00	
Nepal	88	138	221	221	4.98	4.59	8.29	4.83	0.00	0.00
Netherlands	295	314	333	332	1.82	0.60	1.91	0.59	-0.10	-0.03
New Caledonia	9	10	10	10	0.08	0.85	0.06	0.55	0.00	0.00
New Zealand	1 531	2 025	2 024	2 084	49.40	2.84	-0.08	n.s.	6.02	0.29
Nicaragua	n.s.	2	16	66	0.20	22.79	1.37	21.59	5.03	15.30

(Continued)

TABLE A3. *(Continued)*

Country/territory	Planted forest (1 000 ha)				Net annual change					
	1990	2000	2010	2020	1990–2000		2000–2010		2010–2020	
					1 000 ha/yr	%	1 000 ha/yr	%	1 000 ha/yr	%
Niger	48	73	98	123	2.50	4.28	2.50	2.99	2.45	2.26
Nigeria	265	249	233	216	-1.63	-0.63	-1.63	-0.68	-1.63	-0.73
Niue	n.s.	n.s.	n.s.	n.s.	0.00	0.00	0.00	0.00	0.00	0.00
Norfolk Island	n.s.	n.s.	n.s.	n.s.	0.00	0.00	0.00	0.00	0.00	0.00
North Macedonia	–	–	–	–	–	–	–	–	–	–
Northern Mariana Islands	0	0	0	0	0.00		0.00		0.00	
Norway	–	–	115	108	–	–	–	–	-0.70	-0.63
Oman	1	1	1	1	0.00	0.00	0.00	0.00	-0.05	-6.70
Pakistan	254	254	254	254	0.00	0.00	0.00	0.00	0.00	0.00
Palau	–	–	–	–	–	–	–	–	–	–
Palestine	–	–	–	–	–	–	–	–	–	–
Panama	11	33	56	66	2.18	11.49	2.31	5.47	0.98	1.64
Papua New Guinea	61	61	61	61	0.00	0.00	0.00	0.00	0.00	0.00
Paraguay	10	31	51	156	2.03	11.54	2.03	5.23	10.49	11.85
Peru	263	715	970	1 088	45.21	10.52	25.48	3.09	11.86	1.16
Philippines	291	321	351	381	3.00	0.99	3.00	0.90	3.00	0.82
Pitcairn Islands	–	–	–	–	–	–	–	–	–	–
Poland	–	–	–	–	–	–	–	–	–	–
Portugal	2 073	2 268	2 222	2 256	19.50	0.90	-4.60	-0.20	3.40	0.15
Puerto Rico	0	0	0	0	0.00		0.00		0.00	
Qatar	0	0	0	0	0.00		0.00		0.00	
Republic of Korea	1 909	2 072	2 235	2 263	16.31	0.82	16.31	0.76	2.79	0.12
Republic of Moldova	146	155	212	219	0.86	0.57	5.70	3.18	0.68	0.32
Réunion	11	11	11	11	0.00	0.00	0.00	0.00	0.00	0.00
Romania	528	528	540	895	0.00	0.00	1.20	0.22	35.51	5.18
Russian Federation	12 651	15 360	19 613	18 880	270.92	1.96	425.25	2.47	-73.28	-0.38
Rwanda	113	127	138	150	1.35	1.13	1.15	0.87	1.20	0.84
Saint Barthélemy	0	0	0	0	0.00		0.00		0.00	
Saint Helena, Ascension and Tristan da Cunha	0	0	0	0	0.00		0.00		0.00	
Saint Kitts and Nevis	–	–	–	–	–	–	–	–	–	–
Saint Lucia	3	3	3	3	0.00	0.00	0.00	0.00	0.00	0.00
Saint Martin (French part)	0	0	0	0	0.00		0.00		0.00	
Saint Pierre and Miquelon	0	0	0	0	0.00		0.00		0.00	
Saint Vincent and the Grenadines	n.s.	n.s.	n.s.	n.s.	0.01	10.65	0.01	5.62	0.01	4.67
Samoa	5	5	5	5	n.s.	-0.08	n.s.	-0.08	n.s.	-0.02
San Marino	0	0	0	0	0.00		0.00		0.00	
Sao Tome and Principe	0	0	0	0	0.00		0.00		0.00	
Saudi Arabia	0	0	0	0	0.00		0.00		0.00	

(Continued)

TABLE A3. *(Continued)*

Country/territory	Planted forest (1 000 ha)				Net annual change					
	1990	2000	2010	2020	1990–2000		2000–2010		2010–2020	
					1 000 ha/yr	%	1 000 ha/yr	%	1 000 ha/yr	%
Senegal	32	32	32	32	0.00	0.00	0.00	0.00	0.00	0.00
Serbia	39	39	180	116	0.00	0.00	14.14	16.55	-6.46	-4.33
Seychelles	5	5	5	5	0.00	0.00	0.00	0.00	0.00	0.00
Sierra Leone	7	8	15	21	0.12	1.63	0.67	6.39	0.67	3.87
Singapore	0	0	0	0	0.00		0.00		0.00	
Sint Maarten (Dutch part)	0	0	0	0	0.00		0.00		0.00	
Slovakia	739	755	741	749	1.63	0.22	-1.39	-0.19	0.73	0.10
Slovenia	34	48	67	46	1.39	3.49	1.93	3.44	-2.15	-3.78
Solomon Islands	41	33	27	24	-0.84	-2.26	-0.60	-2.01	-0.24	-0.93
Somalia	3	3	3	3	0.00	0.00	0.00	0.00	0.00	0.00
South Africa	3 144	3 144	3 144	3 144	0.00	0.00	0.00	0.00	0.00	0.00
South Sudan	188	188	188	188	0.00	0.00	0.00	0.00	0.00	0.00
Spain	1 945	2 391	2 596	2 590	44.62	2.09	20.52	0.83	-0.64	-0.02
Sri Lanka	257	234	206	250	-2.30	-0.93	-2.80	-1.27	4.40	1.96
Sudan	120	125	127	130	0.50	0.41	0.20	0.16	0.30	0.23
Suriname	13	14	14	14	0.12	0.85	0.00	0.00	0.00	0.00
Svalbard and Jan Mayen Islands	0	0	0	0	0.00		0.00		0.00	
Sweden	8 089	10 318	12 481	13 912	222.90	2.46	216.30	1.92	143.10	1.09
Switzerland	182	172	161	149	-1.06	-0.60	-1.12	-0.67	-1.16	-0.75
Syrian Arab Republic	149	173	196	211	2.40	1.51	2.36	1.29	1.50	0.74
Tajikistan	113	113	113	117	0.05	0.05	0.00	0.00	0.43	0.37
Thailand	1 720	1 987	3 242	3 537	26.70	1.45	125.50	5.02	29.50	0.87
Timor-Leste	0	0	0	0	0.00		0.00		0.00	
Togo	21	34	47	61	1.33	5.10	1.33	3.36	1.34	2.52
Tokelau	0	0	0	0	0.00		0.00		0.00	
Tonga	1	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
Trinidad and Tobago	83	81	81	81	-0.27	-0.33	0.00	0.00	0.00	0.00
Tunisia	153	177	198	214	2.43	1.48	2.05	1.10	1.68	0.82
Turkey	546	556	622	717	0.97	0.18	6.63	1.13	9.53	1.44
Turkmenistan	0	0	0	0	0.00		0.00		0.00	
Turks and Caicos Islands	0	0	0	0	0.00		0.00		0.00	
Tuvalu	0	0	0	0	0.00		0.00		0.00	
Uganda	170	268	367	465	9.84	4.67	9.84	3.17	9.84	2.41
Ukraine	4 567	4 695	4 817	4 848	12.80	0.28	12.20	0.26	3.10	0.06
United Arab Emirates	–	–	–	–	–	–	–	–	–	–
United Kingdom of Great Britain and Northern Ireland	2 434	2 610	2 715	2 846	17.60	0.70	10.50	0.40	13.10	0.47
United Republic of Tanzania	553	553	553	553	0.00	0.00	0.00	0.00	0.00	0.00
United States of America	17 938	22 560	25 564	27 521	462.20	2.32	300.40	1.26	195.70	0.74

(Continued)

TABLE A3. *(Continued)*

Country/territory	Planted forest (1 000 ha)				Net annual change					
	1990	2000	2010	2020	1990–2000		2000–2010		2010–2020	
					1 000 ha/yr	%	1 000 ha/yr	%	1 000 ha/yr	%
United States Virgin Islands	0	0	0	0	0.00		0.00		0.00	
Uruguay	201	629	979	1 182	42.80	12.08	35.01	4.52	20.29	1.90
Uzbekistan	1 193	1 545	1 852	2 267	35.19	2.62	30.72	1.83	41.44	2.04
Vanuatu	–	–	–	–	–	–	–	–	–	–
Venezuela (Bolivarian Republic of)	426	740	989	1 358	31.36	5.67	24.97	2.95	36.89	3.22
Viet Nam	745	1 920	3 083	4 349	117.46	9.93	116.37	4.85	126.61	3.50
Wallis and Futuna Islands	n.s.	n.s.	1	1	0.02	6.35	0.02	3.85	0.01	1.55
Western Sahara	0	0	0	0	0.00		0.00		0.00	
Yemen	0	0	0	0	0.00		0.00		0.00	
Zambia	57	55	54	52	-0.20	-0.36	-0.05	-0.10	-0.24	-0.45
Zimbabwe	154	120	108	108	-3.40	-2.46	-1.20	-1.05	0.00	0.00

Note: The rate of change (%) is calculated as the compound annual change rate.

* A dispute exists between the Government of Argentina and the Government of the United Kingdom of Great Britain and Northern Ireland concerning sovereignty over the Falkland Islands (Malvinas).

TABLE A4. **Proportion of total planted forest area occupied by plantation forest and other planted forest, 1990, 2000, 2010 and 2020**

Country/territory	Plantation forest (% of planted forest)				Other planted forest (% of planted forest)			
	1990	2000	2010	2020	**1990**	**2000**	**2010**	**2020**
Afghanistan	–	–	–	–	–	–	–	–
Albania	0	0	100	0	0	0	0	0
Algeria	0	0	0	0	100	100	100	100
American Samoa	–	–	–	–	–	–	–	–
Andorra	–	–	–	–	–	–	–	–
Angola	100	100	100	100	0	0	0	0
Anguilla	0	0	0	0	0	0	0	0
Antigua and Barbuda	0	0	0	0	0	0	0	0
Argentina	100	100	100	100	0	0	0	0
Armenia	0	0	0	0	100	100	100	100
Aruba	–	–	–	–	–	–	–	–
Australia	100	100	93	81	0	0	7	19
Austria	0	0	0	0	100	100	100	100
Azerbaijan	3	3	4	7	97	97	96	93
Bahamas	–	–	–	–	–	–	–	–
Bahrain	100	100	100	100	0	0	0	0
Bangladesh	100	100	100	100	0	0	0	0
Barbados	–	–	–	–	–	–	–	–
Belarus	n.s.	n.s.	n.s.	n.s.	100	100	100	100
Belgium	100	100	100	100	0	0	0	0
Belize	100	100	100	100	0	0	0	0
Benin	100	100	100	100	0	0	0	0
Bermuda	0	0	0	0	0	0	0	0
Bhutan	100	100	100	100	0	0	0	0
Bolivia (Plurinational State of)	100	77	68	62	0	23	32	38
Bonaire, Sint Eustatius and Saba	–	–	–	–	–	–	–	–
Bosnia and Herzegovina	0	0	0	0	0	0	0	0
Botswana	–	–	–	–	–	–	–	–
Brazil	100	100	100	100	0	0	0	0
British Virgin Islands	0	0	0	0	0	0	0	0
Brunei Darussalam	0	0	0	0	100	100	100	100
Bulgaria	0	0	0	0	100	100	100	100
Burkina Faso	5	5	5	5	95	95	95	95
Burundi	100	100	100	100	0	0	0	0
Cabo Verde	100	100	100	100	0	0	0	0

(Continued)

TABLE A4. *(Continued)*

Country/territory	Plantation forest (% of planted forest)				Other planted forest (% of planted forest)			
	1990	2000	2010	2020	**1990**	**2000**	**2010**	**2020**
Cambodia	100	100	100	100	0	0	0	0
Cameroon	100	100	100	100	0	0	0	0
Canada	0	0	0	0	100	100	100	100
Cayman Islands	–	–	–	–	–	–	–	–
Central African Republic	100	100	100	100	0	0	0	0
Chad	0	0	0	0	100	100	100	100
Chile	100	100	100	100	0	0	0	0
China	80	71	58	54	20	29	42	46
Colombia	100	100	100	100	0	0	0	0
Comoros	100	100	100	100	0	0	0	0
Congo	100	100	100	100	0	0	0	0
Cook Islands	100	100	100	100	0	0	0	0
Costa Rica	100	100	100	100	0	0	0	0
Côte d'Ivoire	100	100	100	100	0	0	0	0
Croatia	100	100	100	100	0	0	0	0
Cuba	100	100	100	100	0	0	0	0
Curaçao	–	–	–	–	–	–	–	–
Cyprus	0	0	0	0	100	100	100	100
Czechia	0	0	0	0	100	100	100	100
Democratic People's Republic of Korea	100	100	100	100	0	0	0	0
Democratic Republic of the Congo	100	100	100	100	0	0	0	0
Denmark	0	0	61	58	0	0	39	42
Djibouti	–	–	–	100	–	–	–	0
Dominica	100	100	100	100	0	0	0	0
Dominican Republic	25	36	40	40	75	64	60	60
Ecuador	100	100	100	100	0	0	0	0
Egypt	0	0	0	0	100	100	100	100
El Salvador	100	100	100	100	0	0	0	0
Equatorial Guinea	–	100	100	100	–	0	0	0
Eritrea	0	29	30	38	100	71	70	62
Estonia	3	3	3	3	97	97	97	97
Eswatini	100	100	100	100	0	0	0	0
Ethiopia	80	80	80	80	20	20	20	20
Falkland Islands (Malvinas)*	–	–	–	–	–	–	–	–
Faroe Islands	100	100	100	100	0	0	0	0
Fiji	100	100	100	100	0	0	0	0
Finland	n.s.	n.s.	n.s.	n.s.	100	100	100	100
France	0	0	0	0	100	100	100	100
French Guiana	100	100	100	100	0	0	0	0
French Polynesia	63	71	66	66	37	29	34	34
Gabon	100	100	100	100	0	0	0	0

(Continued)

TABLE A4. *(Continued)*

Country/territory	Plantation forest (% of planted forest)				Other planted forest (% of planted forest)			
	1990	2000	2010	2020	1990	2000	2010	2020
Gambia	100	100	100	100	0	0	0	0
Georgia	100	100	100	100	0	0	0	0
Germany	0	0	0	0	100	100	100	100
Ghana	100	100	100	100	0	0	0	0
Gibraltar	–	–	–	–	–	–	–	–
Greece	100	100	100	100	0	0	0	0
Greenland	100	100	100	100	0	0	0	0
Grenada	100	100	100	100	0	0	0	0
Guadeloupe	100	100	100	100	0	0	0	0
Guam	–	–	–	–	–	–	–	–
Guatemala	75	73	67	77	25	27	33	23
Guernsey	100	100	100	100	0	0	0	0
Guinea	25	33	38	44	75	67	62	56
Guinea-Bissau	100	100	100	100	0	0	0	0
Guyana	–	–	–	–	–	–	–	–
Haiti	100	100	100	100	0	0	0	0
Holy See	–	–	–	–	–	–	–	–
Honduras	–	–	–	–	–	–	–	–
Hungary	0	0	19	16	0	0	81	84
Iceland	0	0	0	0	100	100	100	100
India	61	77	76	76	39	23	24	24
Indonesia	100	100	100	100	0	0	0	0
Iran (Islamic Republic of)	100	100	100	100	0	0	0	0
Iraq	100	100	100	100	0	0	0	0
Ireland	100	100	100	100	0	0	0	0
Isle of Man	0	0	0	0	0	0	0	0
Israel	0	0	0	0	100	100	100	100
Italy	25	21	20	20	75	79	80	80
Jamaica	100	100	100	100	0	0	0	0
Japan	0	0	0	0	100	100	100	100
Jersey	0	0	0	0	0	0	0	0
Jordan	100	100	100	100	0	0	0	0
Kazakhstan	0	0	0	0	100	100	100	100
Kenya	100	100	100	100	0	0	0	0
Kiribati	0	0	0	0	0	0	0	0
Kuwait	100	100	100	100	0	0	0	0
Kyrgyzstan	0	0	0	0	100	100	100	100
Lao People's Democratic Republic	n.s.	1	7	9	100	99	93	91
Latvia	0	0	2	4	100	100	98	96
Lebanon	0	0	0	0	100	100	100	100
Lesotho	61	61	61	61	39	39	39	39

(Continued)

TABLE A4. *(Continued)*

Country/territory	Plantation forest (% of planted forest)				Other planted forest (% of planted forest)			
	1990	2000	2010	2020	1990	2000	2010	2020
Liberia	100	100	100	100	0	0	0	0
Libya	100	100	100	100	0	0	0	0
Liechtenstein	0	0	0	0	100	100	100	100
Lithuania	0	0	0	0	100	100	100	100
Luxembourg	0	0	0	0	100	100	100	100
Madagascar	100	100	100	100	0	0	0	0
Malawi	100	100	100	100	0	0	0	0
Malaysia	100	100	100	100	0	0	0	0
Maldives	–	–	–	–	–	–	–	–
Mali	0	0	0	0	100	100	100	100
Malta	–	–	–	100	–	–	–	0
Marshall Islands	0	0	0	0	100	100	100	100
Martinique	100	100	99	99	0	0	1	1
Mauritania	0	0	0	0	100	100	100	100
Mauritius	0	0	0	0	100	100	100	100
Mayotte	18	10	7	5	82	90	93	95
Mexico	98	87	93	75	2	13	7	25
Micronesia (Federated States of)	100	100	100	100	0	0	0	0
Monaco	–	–	–	–	–	–	–	–
Mongolia	100	100	100	100	0	0	0	0
Montenegro	100	100	100	100	0	0	0	0
Montserrat	–	–	–	–	–	–	–	–
Morocco	100	100	100	100	0	0	0	0
Mozambique	100	100	100	100	0	0	0	0
Myanmar	100	100	100	100	0	0	0	0
Namibia	–	–	–	–	–	–	–	–
Nauru	–	–	–	–	–	–	–	–
Nepal	100	100	100	100	0	0	0	0
Netherlands	10	1	1	1	90	99	99	99
New Caledonia	100	100	100	100	0	0	0	0
New Zealand	100	100	100	100	0	0	0	0
Nicaragua	100	100	100	100	0	0	0	0
Niger	100	100	100	100	0	0	0	0
Nigeria	100	100	100	100	0	0	0	0
Niue	100	100	100	100	0	0	0	0
Norfolk Island	100	100	100	100	0	0	0	0
North Macedonia	0	0	0	0	0	0	0	0
Northern Mariana Islands	–	–	–	–	–	–	–	–
Norway	0	0	100	100	0	0	0	0
Oman	0	0	0	0	100	100	100	100
Pakistan	100	100	100	100	0	0	0	0

(Continued)

TABLE A4. *(Continued)*

Country/territory	Plantation forest (% of planted forest)				Other planted forest (% of planted forest)			
	1990	2000	2010	2020	1990	2000	2010	2020
Palau	0	0	0	0	0	0	0	0
Palestine	0	0	0	0	0	0	0	0
Panama	100	100	100	100	0	0	0	0
Papua New Guinea	100	100	100	100	0	0	0	0
Paraguay	100	100	100	100	0	0	0	0
Peru	100	100	100	100	0	0	0	0
Philippines	100	100	100	100	0	0	0	0
Pitcairn Islands	0	0	0	0	0	0	0	0
Poland	0	0	0	0	0	0	0	0
Portugal	28	27	31	31	72	73	69	69
Puerto Rico	–	–	–	–	–	–	–	–
Qatar	–	–	–	–	–	–	–	–
Republic of Korea	100	100	100	100	0	0	0	0
Republic of Moldova	0	0	0	0	100	100	100	100
Réunion	91	91	91	91	9	9	9	9
Romania	0	0	0	0	100	100	100	100
Russian Federation	0	0	0	0	100	100	100	100
Rwanda	100	100	100	100	0	0	0	0
Saint Barthélemy	–	–	–	–	–	–	–	–
Saint Helena, Ascension and Tristan da Cunha	–	–	–	–	–	–	–	–
Saint Kitts and Nevis	0	0	0	0	0	0	0	0
Saint Lucia	100	100	100	100	0	0	0	0
Saint Martin (French part)	–	–	–	–	–	–	–	–
Saint Pierre and Miquelon	–	–	–	–	–	–	–	–
Saint Vincent and the Grenadines	25	45	53	57	75	55	47	43
Samoa	57	67	77	87	43	33	23	13
San Marino	–	–	–	–	–	–	–	–
Sao Tome and Principe	–	–	–	–	–	–	–	–
Saudi Arabia	–	–	–	–	–	–	–	–
Senegal	100	100	100	100	0	0	0	0
Serbia	0	0	12	30	100	100	88	70
Seychelles	100	100	100	100	0	0	0	0
Sierra Leone	100	100	100	100	0	0	0	0
Singapore	–	–	–	–	–	–	–	–
Sint Maarten (Dutch part)	–	–	–	–	–	–	–	–
Slovakia	0	n.s.	1	1	100	100	99	99
Slovenia	0	0	0	0	100	100	100	100
Solomon Islands	97	97	97	96	3	3	3	4
Somalia	100	100	100	100	0	0	0	0
South Africa	40	40	40	40	60	60	60	60

(Continued)

TABLE A4. *(Continued)*

Country/territory	Plantation forest (% of planted forest)				Other planted forest (% of planted forest)			
	1990	2000	2010	2020	1990	2000	2010	2020
South Sudan	100	100	100	100	0	0	0	0
Spain	39	39	39	39	61	61	61	61
Sri Lanka	100	100	100	100	0	0	0	0
Sudan	100	100	100	100	0	0	0	0
Suriname	100	92	92	92	0	8	8	8
Svalbard and Jan Mayen Islands	–	–	–	–	–	–	–	–
Sweden	0	6	5	3	100	94	95	97
Switzerland	n.s.	n.s.	1	1	100	100	99	99
Syrian Arab Republic	100	100	100	100	0	0	0	0
Tajikistan	69	69	69	69	31	31	31	31
Thailand	100	100	100	100	0	0	0	0
Timor-Leste	–	–	–	–	–	–	–	–
Togo	80	80	80	80	20	20	20	20
Tokelau	–	–	–	–	–	–	–	–
Tonga	100	100	100	100	0	0	0	0
Trinidad and Tobago	72	74	74	74	28	26	26	26
Tunisia	33	33	33	33	67	67	67	67
Turkey	100	100	100	100	0	0	0	0
Turkmenistan	–	–	–	–	–	–	–	–
Turks and Caicos Islands	–	–	–	–	–	–	–	–
Tuvalu	–	–	–	–	–	–	–	–
Uganda	100	100	100	100	0	0	0	0
Ukraine	7	7	7	8	93	93	93	92
United Arab Emirates	0	0	0	0	0	0	0	0
United Kingdom of Great Britain and Northern Ireland	0	0	0	0	100	100	100	100
United Republic of Tanzania	100	100	100	100	0	0	0	0
United States of America	34	39	49	51	66	61	51	49
United States Virgin Islands	–	–	–	–	–	–	–	–
Uruguay	100	100	100	100	0	0	0	0
Uzbekistan	52	63	71	64	48	37	29	36
Vanuatu	0	0	0	0	0	0	0	0
Venezuela (Bolivarian Republic of)	99	90	88	91	1	10	12	9
Viet Nam	100	100	100	100	0	0	0	0
Wallis and Futuna Islands	100	100	100	100	0	0	0	0
Western Sahara	–	–	–	–	–	–	–	–
Yemen	–	–	–	–	–	–	–	–
Zambia	100	100	98	87	0	0	2	13
Zimbabwe	100	100	100	100	0	0	0	0

* A dispute exists between the Government of Argentina and the Government of the United Kingdom of Great Britain and Northern Ireland concerning sovereignty over the Falkland Islands (Malvinas).

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Corrigendum

12/11/2020

The following corrections were made to the PDF of the report after it went to print.

Page	Location	Text in printed PDF	Text in corrected PDF
3	Second column, line 16	Team of Specialists on Sustainable Forest Management	Team of Specialists on Monitoring Sustainable Forest Management
15	Table 4 caption	Top ten countries and territories for forest cover as a percentage of total land area, 2020	Top ten countries and territories for forest area as a percentage of total land area, 2020
48	Table 38 caption	Volume of biomass and dead-wood stock, by region and subregion, 2020	Biomass and dead-wood stock, by region and subregion, 2020
70	Figure 32 caption	Proportion of total forest area designated primarily for other purposes by region, 1990-2020	Proportion of total forest area designated primarily for other management objectives by region, 1990-2020
79	Second column, starting from line 14 and 15	The share was 100 percent in 48 of those countries, of which 29 were in Asia (mostly Western and Central Asia) and 26 were in Africa (mostrly Western and Central Africa).	The share was 100 percent in 48 of those countries, of which 23 were in Asia (mostly Western and Central Asia) and 16 were in Africa (mostrly Western and Central Africa).
83	Table 69 heading	Forest ownership	Management rights
84	Figure 38	Proportion of total publicly owned forest area, by holder of administrative rights and region, 2015	Proportion of total publicly owned forest area, by holder of management rights and region, 2015
96	Table 78 3rd and 4th column heading	Degraded forest area/Degraded forest area as % of forest area	Forest area of reporting countries/% of total forest area
120	Note 26	The analysis was conducted by Karimon Nesha, Veronique De Sy and Martin Herold (CIFOR/Wageningen Univesity), updating a previous publication by Romin *et al* (2015).	The analysis was conducted by Mst Karimon Nesha, Veronique De Sy and Martin Herold (CIFOR/Wageningen Univesity), updating a previous publication by Romin *et al* (2015).

Since its creation in 1946,
FAO has been monitoring the world's forest resources through periodic assessments conducted in cooperation with its member countries.

The *Global Forest Resources Assessment 2020* (FRA 2020), the latest of these assessments, examines the status of, and trends in, more than 60 forest-related variables in 236 countries and territories in the period 1990–2020.

This main report of FRA 2020 presents a comprehensive view of the world's forests and the ways in which the resource is changing. Such a clear global picture supports the development of sound policies, practices and investments affecting forests and forestry.

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